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R-31-1-3-1

REMEDIAL ACTION MASTER PLAN

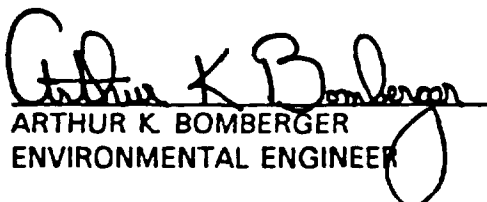
LEES LANE LANDFILL
LOUISVILLE, KENTUCKY

EPA WORK ASSIGNMENT
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EXECUTIVE SUMMARY

This Remedial Action Master Plan (RAMP) for the Lees Lane Landfill will act as a general planning document and a site management tool. This report contains information necessary for planning a coherent remedial strategy and for assisting in the selection of an appropriate course of action.

Site Description and History

The Lees Lane Landfill is a 125-acre site located on the banks of the Ohio River approximately 4.4 miles southwest of Louisville, Kentucky. The site is located between the river and the Army Corps of Engineers flood protection levee.

Prior to 1948, the Lees Lane Site served as a sand and gravel quarry under the ownership of the Hofgesang Company. Between 1948 and 1975, the site was used as a landfill for disposal of domestic, commercial, and industrial wastes. It is estimated that 212,000 tons of diversified chemical wastes were deposited at the site. The landfill operation was closed in 1975 because of methane gas generation and migration into adjacent homes.

The Lees Lane Site was ranked 260th of 418 sites on the Proposed National Priorities List, issued by the EPA in December 1982.

Environmental Concerns

The environmental concerns for each of the four environmental pathways are briefly summarized below. Remedial actions to date are also noted.

- Air

Gas generation and migration problem is well documented. Off-gases include methane and vinyl chloride. A gas venting system was installed in 1980.

- Groundwater

The aquifer immediately beneath site appears to be contaminated with several organic and inorganic constituents. At this time, there is no indication of aquifer contamination off-site, but this needs to be confirmed by testing.

- Soil

There are no data available on soil contamination. In 1981, 400 exposed drums were reburied on site and all liquid wastes in the drums were hauled off site to a different disposal location. During a February 1983 site visit by NUS FIT personnel, approximately 25 additional drums were found on site (apparently these drums were missed during the 1981 cleanup). Some of these drums are in bad condition, with some leakage of these drums possibly leading to a contaminatin of the soil.

- Surface Water

There are no data available on surface water contamination.

Proposed Remedial Actions

Two types of remedial actions, initial remedial measures (IRMs) and long-term remedial responses, are used in remedial planning at hazardous waste sites. IRMs are implemented to prevent actual or potential exposure to a significant environmental problem. Long-term remedial responses are required to minimize and mitigate the migration of hazardous substances and the effects of such migration.

It is important to note that the remedial responses identified are based on the assumption that there are no current plans to develop the Lees Lane Site into any type of a facility that would be used by the general public.

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The IRMs proposed for the Lees Lane Site are:

- Implement a long-term preventive maintenance (PM) program for the existing gas venting system.
- Initiate a long-term air monitoring program at the exhaust of the gas venting blower and in and around selected residences near the site.
- Conduct a survey of existing off-site well usage.
- Install warning signs around the perimeter of the site.
- Remove approximately 25 drums found on site in February 1983.

The IRMs will be implemented independent of the long-term measures.

The long-term measures which should be investigated are listed below.

- Erosion control measures along the Ohio River bank.
- "No Action Alternative." (Under this scenario, no long-term responses per se would be implemented; however, the initial remedial measures and the post closure maintenance and monitoring recommendations would be implemented.)

NOTE: Other long-term remedial responses may or may not be identified after the remedial investigation is completed.

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The remedial planning activities which will investigate, select and implement the long-term remedial measures are listed below in the sequence in which they will occur.

(1) Remedial Investigation

- Groundwater investigation
- Soil investigation and waste location
- Surface water investigation
- Remedial investigation report

(2) Engineering Feasibility Study

(3) Remedial Action Design

(4) Remedial Action Implementation (Construction)

(5) Post-Closure Maintenance and Monitoring Program

000341**1.0 INTRODUCTION**

This Remedial Action Master Plan (RAMP) is prepared in accordance with the rules of the National Contingency Plan (NCP) (F.R. Vol. 47 No. 137, July 16, 1982) published pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980. Remedial actions are those responses to sites on the National Priority List that prevent or mitigate the release of hazardous substances. The specific aspects of remedial actions are presented as Phase VI, Section 300.68 of the NCP.

The RAMP will be the basis of a scoping decision to be made by the lead agency (EPA or other agency) for requesting funding for remedial actions. In addition, this RAMP and subsequent revisions will serve as the basis of the workscope under the U.S. EPA - State agreements or contracts and as the primary planning document for all remedial action activities at the site and for all related enforcement activities.

This RAMP has been prepared exclusively from existing information. This information includes sampling data; maps and topological information; generator, hauler, and site operator records; and previous regulatory and remedial actions.

This RAMP contains three major sections: (1) compilation of existing data, contained in Sections 2.0 through 6.0; (2) evaluation of data, Sections 7.0 through 9.0; and (3) remedial planning, Sections 10.0 through 13.0. A site chronology, work plan outlines, and other pertinent information is appended.

2.0 THE SITE**2.1 Location**

Lees Lane Landfill, a tract of land of approximately 125 acres, is located along the Ohio River in Jefferson County, Kentucky (Figure 2-1). The landfill is approximately 4.4 miles southwest of Louisville, Kentucky. A location reference point of the landfill is at the intersection of Lees Lane and the levee. This point is located at 38°11'44" N latitude and 85°52'17" W longitude (E & E Remedial Approach Plan, December 1981).

2.2 Site Layout

Lees Lane Landfill is approximately 5,000 ft in length and averages approximately 1,500 ft in width. The northern and middle portions of the landfill consist of level to gently sloping land. The southern portion is pocketed with excavations with relatively steep slopes. Three terraces, each approximately 20 ft wide, comprise the slope on the riverside of the landfill. Relatively steep erosional cuts are common along the southern portion of this slope. The site is bordered on the east and south by the Army Corps of Engineers flood protection levee. Elevations range from 410 feet above mean sea level (msl) along the Ohio River to 463 msl along the levee (E & E Remedial Approach Plan, December 1981).

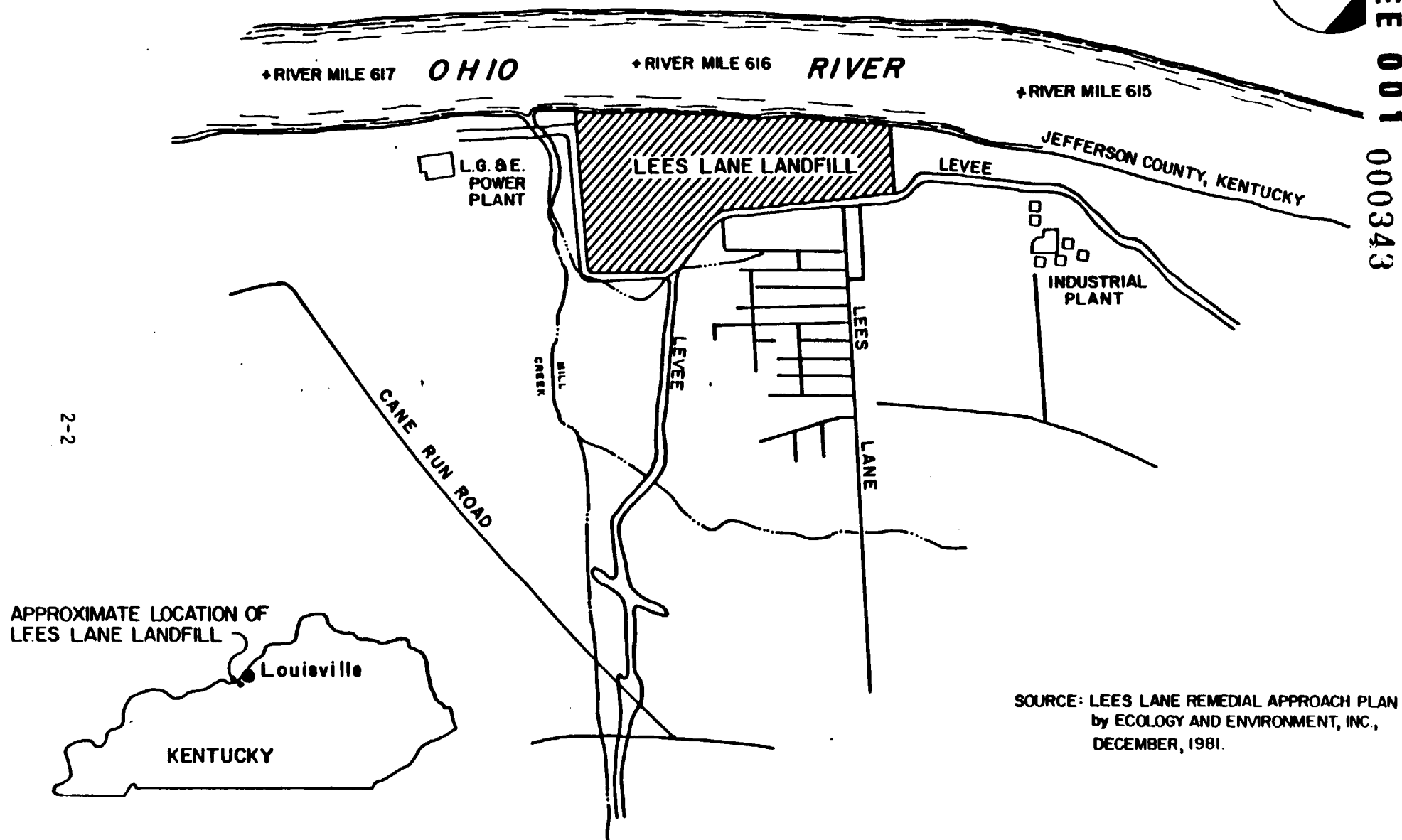
2.3 Ownership History

Lees Lane Landfill is comprised of three tracts of land. The northern two tracts were owned by Jos. C. Hofgesang until his death on March 10, 1972. Following his death, ownership went to the current owner, the Hofgesang Foundation, Inc., which is a private foundation set up in perpetuity.

The southern tract was owned up to the mid 1960's by Gernert Court, Inc. During the mid 1960's, they changed their name to the Jos. C. Hofgesang Sand Co., Inc.



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LOCATION OF LEES LANE LANDFILL

SCALE: 1" = 2000'

FIGURE 2 - 1



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The sand company owned the site until the permit expired in November 1974, at which time J. H. Realty, Inc. acquired it. J. H. Realty, Inc. is the current owner of the southern tract.

2.4 Site Use History

Prior to use as a landfill, the Lees Lane Site was a sand and gravel quarry operated by the Hofgesang Company. Beginning in 1948, the site began receiving wastes from domestic, commercial, and industrial sources. In April 1975, the landfill was closed (E & E Remedial Approach Plan, December 1981).

Based on the brief site visit conducted in December 1982 during the preparation of this report, it appears that the site is used occasionally by hunters, target shooters, and as a dumping ground for area residents.

2.5 Permit and Regulatory Action History

November 16, 1974	Expiration of Lees Lane Landfill Permit. (Date of permit issuance is unknown.)
April 3, 1975	Temporary restraining order issued by the Franklin Circuit Court to restrain operation of Lees Lane Landfill.
April 8, 1975	Franklin Circuit Court found that Lees Lane Landfill has been operating without a permit since it expired on 11-16-74.
April 2, 1980	Secretary of Kentucky DNREP issued an Order to Abate and Alleviate conditions surrounding the barrels of hazardous wastes that were exposed along the bank of the Ohio River.
May 21, 1980	Exception to the State's Abate and Alleviate order filed by Ben Hardy indicating that he plans to take no action to remove the exposed drums.

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June 12, 1980	Sec. of KYDNREP issued order that the Order to Abate and Alleviate "... shall remain in full force and effect."
August 5, 1980	Complaint filed by KYDNREP in Franklin Circuit Court against J. H. Realty, Inc. and The Hofgesang Foundation, Inc. for not following the Order to Abate and Alleviate the condition of the drums.
January 19, 1981	KYDNREP granted summary judgment against Ben Hardy giving him 90 days to remove the drums.
October 1981	Exposed drums were removed.
December 1982	The Lees Lane Site was ranked 260th of 418 sites on the Proposed National Priorities List, issued by the EPA.

2.6 Remedial Actions to Date

Several remedial actions have been implemented at the Lees Lane Site. The first three actions listed below were identified in the December 1981 Remedial Approach Plan prepared by Ecology and Environment, Inc.

October 1980	Gas venting system was installed to alleviate the methane gas problem.
March 1981	Groundwater monitoring wells were installed during March 1981. These wells were not developed properly, and therefore have limited use.
September- October 1981	Actions were taken to address approximately 400 exposed drums located along the banks of the Ohio River. The empty drums and the drums containing solid or semi-solid materials were buried on site. The drums which contained liquid wastes were emptied and then buried on site. The liquid wastes were then transported off site to a disposal facility.

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March-June 1982 Resistivity and magnetometer surveys were conducted by Ecology and Environment, Inc.

November 3, 1982 Sediment and leachate samples were collected by Ecology and Environment, Inc.

February 1983 During a site visit conducted by NUS FIT personnel to locate sites for monitoring wells, approximately 25 drums were found in heavy underbrush, on the northern tract of the landfill. These drums were apparently missed during the 1981 drum removal.

One additional remedial action which will occur in the near future is a new groundwater sampling program designed by Ecology and Environment, Inc. Monitoring wells will be drilled between May and June 1983, and groundwater samples will be collected in June 1983. This work will be directed by the Atlanta FIT office of NUS Corporation.

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3.0 ENVIRONMENTAL SETTING

3.1 Surface Waters

The Lees Lane Landfill is bordered on the west by the Ohio River. The site, located at River Mile No. 616, is on the riverside of the earthen levee and is subject to flooding during high water periods. A more detailed discussion of flood levels is presented in the December 1981 Remedial Approach Plan, by Ecology and Environment, Inc.

Surface runoff from the site into the Ohio River has created deep erosional cuts in the riverbank.

Mill Creek is a small stream which flows along the southern boundary of the landfill, on the other side of the levee. Mill Creek flows through the levee, just before it discharges into the Ohio River, south of the site.

Two ponds, a swamp, and intermittent streams are also located on site. These surface water bodies apparently result from surface runoff and possibly from groundwater exposure. The swamp and ponds are located in the southern portion of the site.

Seeps can be found during low river levels along the Ohio River Bank where groundwater breaks out of the ground and enters the river.

3.2 Geology and Soils

The topography of Lees Lane Landfill has been determined mainly by the extensive man-made excavation and fill operations at the site. Secondary, but significant influences in the topography have been the erosional and depositional processes of the Ohio River (E & E Remedial Approach Plan, December 1981).

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The natural soils of the site consisted of fine-sandy loam to silty loam of the Wheeling-Weinbach-Huntington soil association. They were moderately- to well-drained soils on level to sloping topography (E & E Remedial Approach Plan, December 1981).

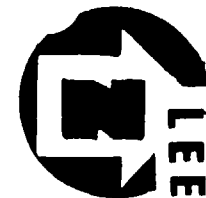
The Lees Lane Landfill is located on the alluvium of the Ohio River. The unconsolidated material has been explored to a depth of approximately 60 ft via borings done when the gas venting system was installed. These holes were drilled for the emplacement of monitoring wells I-1 through I-14 (Figure 3-1). The logs show a fining-upward sedimentary sequence which grades from sand and gravel to clayey silt. A June 4, 1982 letter from E & E to the EPA states that resistivity soundings indicate "permeable sand zones" at 45, 60, and 80 ft below the ground surface. Existing drilling information however, does not substantiate the presence of these lenses. Drilling information indicates that the alluvium is on the order of 100 feet thick (E & E Remedial Approach Plan, December 1981).

Although the bedrock has not been explored beneath the site, regional information indicates that it is probably the Devonian New Albany Shale. The site occupies the western flank of a regional structural feature termed the Cincinnati Arch, and bedrock dips westward at $<1^\circ$. The New Albany Shale is approximately 100 ft thick where unbreached by erosion (E & E Remedial Approach Plan, December 1981). The extent of erosion in the Ohio River Valley is unknown; hence, the thickness of the shale underlying the alluvium is unknown. The New Albany Shale is underlain by a series of limestones and dolomites (Figure 3-2).

3.3 Groundwaters

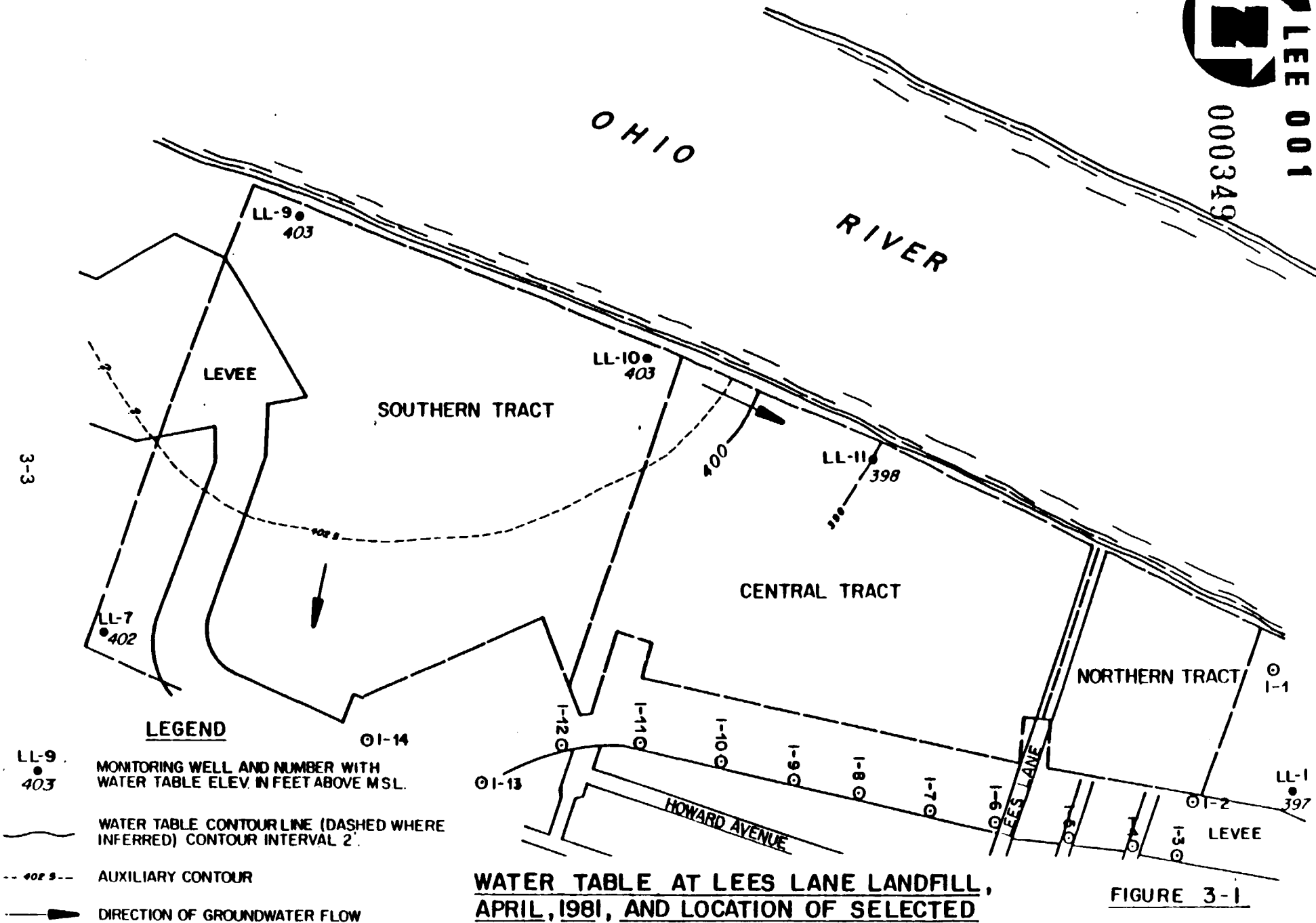
Drilling information and knowledge of hydrogeologic properties are incomplete, but local hydrogeology appears to consist of an alluvial aquifer separated from a deeper carbonate aquifer by a shale aquitard. Permeability of the alluvium has been cited as 5×10^{-1} cm/sec (134 ft/day) (E & E Remedial Approach Plan, December 1981).

NOTE: THIS FIGURE DEMONSTRATES REVERSED GROUNDWATER FLOW WHICH OCCURS DURING HIGH RIVER LEVELS.



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SOURCE: LEES LANE REMEDIAL APPROACH PLAN by
ECOLOGY AND ENVIRONMENT, INC., DEC., 1981

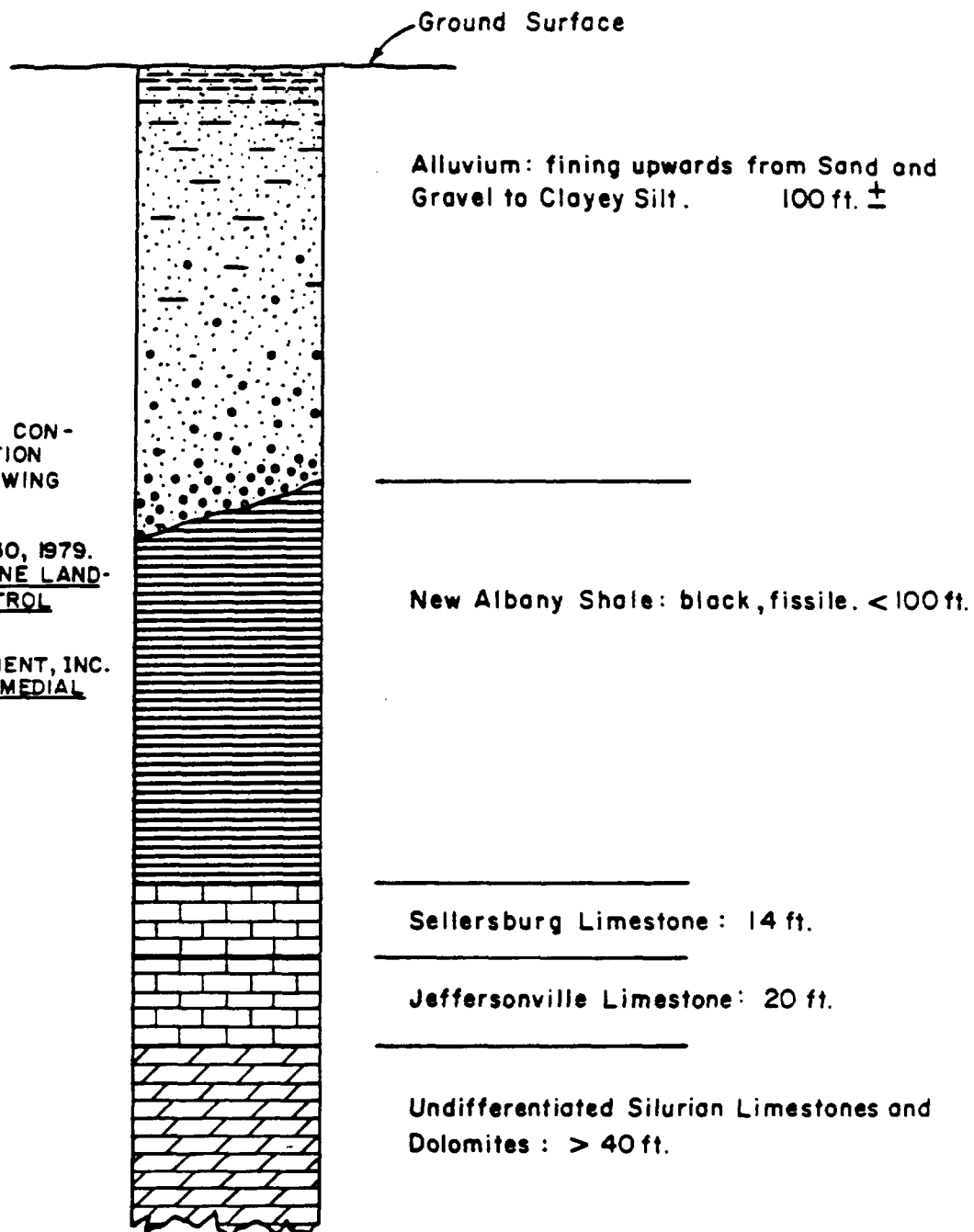
FIGURE 3-1

NUS
CORPORATION

NOTE: THIS COLUMN WAS CON-
STRUCTED FROM INFORMATION
CONTAINED IN THE FOLLOWING
REFERENCES.

1.) SCS ENGINEERS, JULY 30, 1979.
DESIGN REPORT - LEES LANE LAND-
FILL, METHANE GAS CONTROL
SYSTEM.

2.) GEOLOGY AND ENVIRONMENT, INC.
DECEMBER 14, 1981. FIT REMEDIAL
APPROACH PLAN.



GENERALIZED GEOLOGIC COLUMN
IN THE VICINITY OF LEES LANE LANDFILL

NOT TO SCALE

FIGURE 3 - 2

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Because of the high permeability of the geologic materials, and the proximity of the site to the Ohio River, the water table is very sensitive to fluctuations in river stage. At normal river stage groundwater flows toward the river, as demonstrated by data collected in October 1981 (Figure 3-3). The data in Figure 3-3 is somewhat suspect, however, because the depths of the wells in which water levels were measured, and the period of time over which the data was collected, are not known.

The deflection in the 410-ft contour line near the intersection of Lees Lane and Cane Run Road may indicate an unknown pumping center, or a lateral change in aquifer thickness or permeability. It is also possible that the two wells which define the contour anomaly may be finished at different depths than the other wells surveyed, in which case the data collected from those wells may be describing the hydraulic characteristics of a different geologic unit.

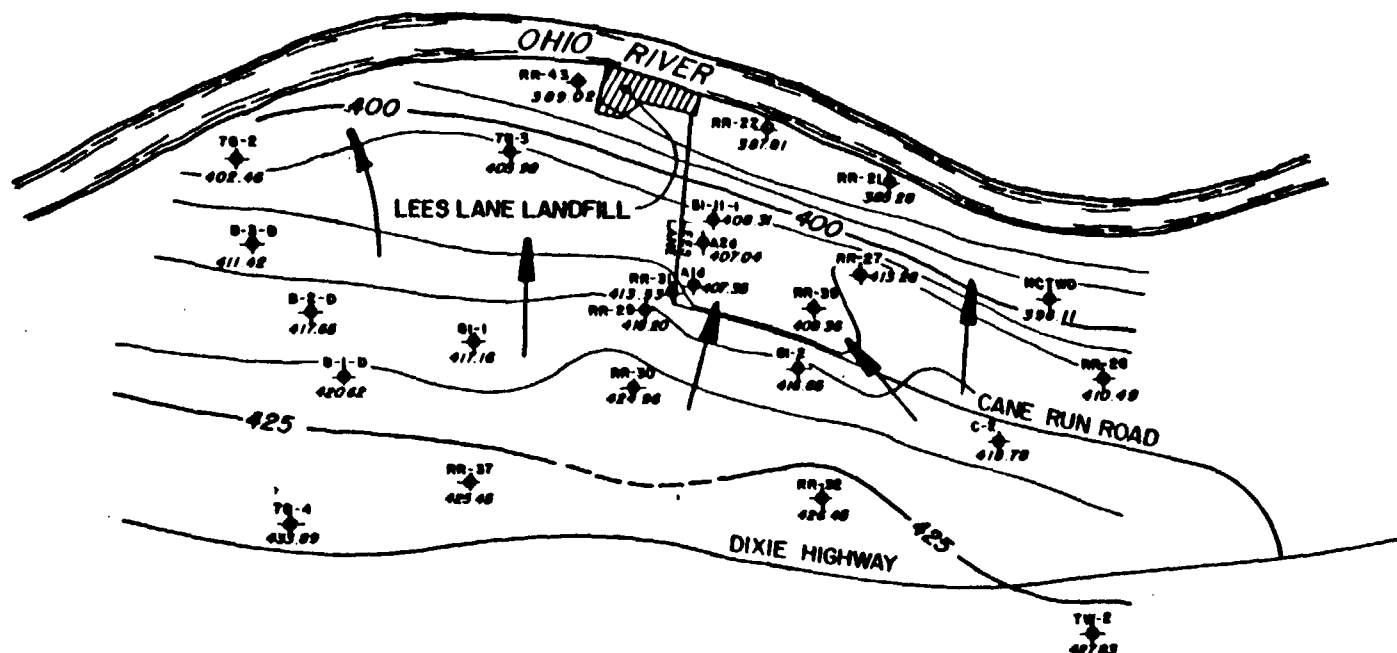
Water levels measured in monitoring wells LL-1, LL-7, LL-9, LL-10, and LL-11 (during April 1981) show groundwater flow away from the river (Figure 3-1). The water levels in these wells are higher than would be expected from the extrapolation of the October 1981 data presented in Figure 3-3. The October 1981 data presented in Figure 3-3 indicate the water table under the site is at approximately 388 ft, while the April 1981 data in Figure 3-1 suggest the water table is at approximately 400 ft. The groundwater flow reversal in April 1981 indicates that the Ohio River must have been above normal stage. (Although the construction of the monitoring wells is questionable, they are all finished in the alluvial water-table aquifer, so the water levels are probably accurate enough for a general discussion such as this.)

The vertical component of groundwater flow is unknown. An upward component of flow is common in river valleys, with the groundwater system discharging to the river. However, the possibility of a downward component should not be neglected without further study. It should also be pointed out that the direction of the vertical component may change with river stage.






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-  DIRECTION OF GROUNDWATER FLOW
-  OBSERVATION WELL AND NUMBER WITH WATER TABLE ELEV. IN FEET ABOVE M.S.L.
-  WATER TABLE CONTOUR, DASHED WHERE INFERRED (CONTOUR INTERVAL = 5')

SOURCE: LEES LANE REMEDIAL APPROACH PLAN by
ECOLOGY AND ENVIRONMENT, INC., DECEMBER, 1981.

WATER TABLE IN VICINITY OF LEES LANE LANDFILL, OCTOBER, 1981, AND LOCATION OF SELECTED PRIVATE WELLS

SCALE: 1" = 1 MILE

FIGURE 3-3

A well drilled into the river bottom by the USGS in 1945 (Well No. 52-11-19) had a water level more than 3 feet above river stage (USGS, 1945), indicating an upward gradient. However, this condition may have been changed by man's activities since 1945.

If the carbonate aquifer underlying the New Albany Shale is pumped heavily, the decrease in hydraulic head in that aquifer may cause groundwater to flow downward from the alluvium through the shale. Although this possibility seems remote, little is known about the carbonate aquifer and development of wells therein.

3.4 Climate and Meteorology

The climate of the Louisville Area is influenced by very cold air masses from the northwest and the Great Lakes region in winter and very warm air masses from the Gulf of Mexico in summer. The average annual precipitation for the area is 41.3 inches. Sixty percent of this value is lost as evaporation and transpiration (E & E Remedial Approach Plan, December 1981).

3.5 Land Use

Lees Lane Landfill is bordered to the northeast by Borden, Inc. (a chemical manufacturer); to the south by Louisville Gas and Electric (a power plant); and to the east by Riverside Gardens (a residential development). A floodwall right-of-way fringes the property line abutting Riverside Gardens, which has approximately 330 homes and 1,100 people (Design Report; SCS Engineers, 7/30/79).

The terrestrial flora on and near Lees Lane Landfill has been subjected to societal disturbances. The landfill surface supports typical field grasses. The grass cover is successfully established over most of the landfill, with the exception of some erosional areas near the river and in the Army Corps of Engineers levee construction area on the southern side of the landfill. North of the landfill there is an industrial park. The east side of the landfill is bordered by the levee which serves as a managed buffer zone between the landfill and the adjacent residential

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development. The west side of the site has a relatively undisturbed area which serves as a buffer zone between the landfill and the Ohio River. This strip of land supports a more dense growth of grasses, shrubs, and trees typical of bottomland riparian woods. This stretch of woods is subject to periodic inundation by the Ohio River (E & E Remedial Approach Plan, December 1981).

The characteristics of the invertebrate community as a whole in the river near the landfill is reported to be dominated by pollution-tolerant organisms. For a more detailed discussion of the invertebrate community, endangered species, benthic community, wildlife and the aquatic communities of the Ohio River, and some of its tributaries, refer to the E & E Remedial Approach Plan, December 1981.

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4.0 POTENTIAL RECEPTORS

4.1 Population Distributions

According to the July 2, 1982 Expanded Eligibility Information Package, there are an estimated 1,470 people living within a one-mile radius of the site. This estimate (developed from an aerial photo) is based on 387 houses at an average per-house occupancy of 3.8 persons.

4.2 Water Users

4.2.1 Groundwater

It is estimated that 14 homes (53 people) are using wells which draw from the aquifer under the site. These residential wells are located to the east of the site within a three-mile radius. This information was developed by using an aerial photo and from a physical survey (July 1982 Expanded Eligibility Information Package).

Industrial facilities north of the site are also thought to be using the aquifer under the Lees Lane Site (July 1982 Expanded Eligibility Information Package).

4.2.2 Surface Water

Surface waters within a three-mile radius of the site are used only for cooling water and for recreational uses (July 1982 Expanded Eligibility Information Package).

The closest Ohio River downstream intake for a public drinking water supply is located at West Point, Kentucky, approximately 14 miles downstream from the Lees Lane Site.

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4.3 Land Users

The Lees Lane Site is bordered on the west by the Ohio River. Active industrial facilities are located north and south of the site, and a residential area of individual family homes (Riverside Gardens) is located east of the site.

Based on the brief site visit conducted in December 1982 during the preparation of this report, it appears that the site is used occasionally by hunters, target shooters, and as a dumping ground for area residents.

5.0 HAZARDOUS SUBSTANCES**5.1 Location On-Site**

The magnetometer survey conducted during the week of May 17-21, 1982, by Ecology and Environment, Inc., delineated areas of ferromagnetic material buried on the site. Thirty-three acres were outlined and are shown in Figure 5-1.

In general, the magnetometer survey indicates that the larger waste areas are near the center of the site and correspond roughly with the areas of excavations shown in the 1963 aerial photograph. No information has been gathered to determine the depth or thickness of the waste deposits.

During a site visit conducted by NUS FIT personnel in February 1983 to locate monitoring wells, approximately 25 drums of waste were found on the northern tract of the landfill. In the area surrounding these drums, heavy organic odors were noticed and a black liquid was apparently leaking from one of the drums. At this time, there is no existing information as to the contents of these drums.

5.2 Physical, Chemical, and Hazardous Characteristics**5.2.1 Form**

Historical records indicate that 212,400 tons of industrial waste (some drummed), were disposed at Lees Lane Landfill. In addition, municipal solid waste was deposited at the site, but the quantity is unknown. There is no evidence that the drums were segregated in trenches or individual pits, or that the municipal solid wastes were deposited in cells. There is no evidence of an impermeable barrier between the solid waste and the groundwater. The landfill was probably formed by random dumping of various wastes into open pits created by sand and gravel mining operations.

5.2.2 Physical State

Wastes were deposited in the Lees Lane Landfill as solids and liquids. It is assumed that uncontained liquid and solid wastes are located in the landfill.

Some of the wastes have decomposed, creating gas. Appendix F of the December 1981 Remedial Approach Plan by Ecology and Environment, Inc., summarizes gas sampling from the air spaces of various monitoring wells. These data, collected in 1978 and 1979, indicated methane concentrations as high as 83% as well as the presence of vinyl chloride.

5.2.3 Chemical Compounds

Table 5-1 presents a partial list of the types and amounts of chemical wastes deposited in the Lees Lane Landfill (December 1981 E & E Remedial Approach Plan).

The only analytical account of wastes on the site was provided by five samples from the 400 drums which were exposed along the Ohio River Bank. The drum samples contained 51 different organic compounds as well as high concentrations of copper, cadmium, nickel, lead, and chromium. Benzene, phenol, and their ethylated derivatives were also identified. The analytical results from the drum samples were reported by the Kentucky Department for Natural Resources and Environmental Protection in 1980. This data is presented in detail in Appendix A of the December 1981 E & E Remedial Approach Plan.

Several gaseous contaminants have also been detected at the Lees Lane Site. As mentioned previously, Appendix F of the December 1981 E & E Remedial Approach Plan contains well sampling data on methane and vinyl chloride. Table 5-2 presents additional data on gaseous contaminants measured at the site (presumably from wells).

TABLE 5-1

HAZARDOUS WASTES REPORTED AS DISPOSED IN LEES LANE LANDFILL

<u>Company</u>	<u>Dates Used</u>	<u>Disposal Methods</u>	<u>Hundred Tons</u>	<u>Type of Waste</u>
B. F. Goodrich	1948-1975	Industrial-Municipal Co-disposal	1689	heavy metals, trace metals, zinc, cadmium, copper, chromium (Trivalent) lead, organic, halogenated aliphatics, acrylates and latex emulsions, plastizers, resins, elastomers, misc.
Harshaw Chemical Company	1950-1967	Industrial-Municipal Co-disposal	1	heavy metals, trace metals, arsenic, selenium, antimony, iron, manganese, magnesium, zinc, cadmium, copper, chromium (trivalent), chromium (hexavalent), lead, organics, insecticides and intermediates, amides, amines, imides, resins, inorganics, salts, miscellaneous, paints and pigments
Rohm & Hass	1962-1970	Industrial-Municipal Co-disposal Drummed Waste	343	acid solutions (with pH <3), organic acid manufacture, organics, amides, amines, imides, plastizers, resins, inorganics, salts

TABLE 5-1
HAZARDOUS WASTES REPORTED AS DISPOSED IN LEES LANE LANDFILL
PAGE TWO

<u>Company</u>	<u>Dates Used</u>	<u>Disposal Methods</u>	<u>Hundred Tons</u>	<u>Type of Waste</u>
Celanese Corp	1967-1974	Industrial- Municipal Co-disposal Drummed waste	91	acid solutions (pH < 3), heavy metals, trace metals, arsenic, selenium, antimony, mercury, iron, manganese, magnesium, zinc, cadmium, copper, chromium (trivalent), chromium (hexavalent), lead, organics, halogenated aliphatics, amides, amines, imides, resins, solvents (polar - except water), carbontetra- chloride, other solvents (non-polar), solvents (halogenated aliphatic), oils and oil sludges, esters, and ethers, alcohols, ketones and aldehydes, inorganics, salts, misc. paints and pigments, asbestos, wastes with flash point below 100°F

5-5

Note: This table was taken directly from the December 1981
Remedial Approach Plan by Ecology and Environment, Inc.

TABLE 5-2
LEES LANE LANDFILL
WELL GAS ANALYSIS*

Compound	U.S. EPA 3/19/75 to 3/30/75				SCS Engineers 12/1/78				SCS Engineers 5/3/79				Composite (all 3 sets)			
	Mean	Min.	Max.	An ¹	Mean	Min.	Max.	An ¹	Mean	Min.	Max.	An ¹	Mean	Min.	Max.	An ¹
Benzene	15	15	15	1	8.8	0.1	29.5	6	6.0	0	45.8	8	7.7	0	45.8	15
Butane	--	--	--	0	--	--	--	0	--	--	--	0	--	--	--	0
Butene	30	30	30	1	--	--	--	0	--	--	--	0	30	30	30	1
Butane/Butene	--	--	--	0	8.6	0	17.7	6	0.3	0	1.8	8	3.9	0	17.7	14
Chlorobutene	--	--	--	0	3.7	0.1	14.7	6	1.4	0	10.8	8	2.4	0	14.7	14
Chloroethane	1	1	1	1	--	--	--	0	--	--	--	0	1	1	1	1
Cyclohexane	5	5	5	1	0	0	0	6	3.1	5.6	19	8	2.0	0	19	15
Dichlorodifluoro- methane (freon)	--	--	--	0	0	0	0	6	10.9	0	25.7	8	6.2	0	25.7	14
Dichloroethane	22.5	22.5	22.5	1	9.1	0.8	22.7	6	1.9	0	14.9	8	6.2	0	22.7	15
Dichloroethene	40	40	40	1	--	--	--	0	--	--	--	0	40	40	40	1
Dimethylcyclohexane	--	--	--	0	0	0	0	6	--	--	--	0	0	0	0	6
Ethylbenzene	27.5	27.5	27.5	1	12.0	8.6	16.6	6	0.3	0	2.0	8	6.2	0	27.5	15
Ethylene	--	--	--	0	--	--	--	0	2.2	0	9.2	8	2.2	0	9.2	8
Heptane	15	15	15	1	0.03	0	0.1	6	--	--	--	0	2.2	0	15	8
Heptene	20	20	20	1	0	0	0	6	--	--	--	0	2.9	0	20	7
Hexane	15	15	15	1	10.3	0	36.8	6	1.8	0	6.7	9	5.8	0	36.8	16
Isobutane	10	10	10	1	1.8	0	11.0	6	1.6	0	10.8	8	3.1	0	11.0	15
Methylcyclopentane	5	5	5	1	0	0	0	6	--	--	--	0	1.0	0	5	7
Toluene	175	175	175	1	12.2	0.1	23.6	6	0.8	0.7	5.7	8	17.0	0.1	175	5
Vinyl Chloride	6.7	0.0005	51	20	50.5	17.4	134	15	37.0	0	188	9	27.8	0	188	44
Xylene	45	45	45	1	4.7	0	10.7	6	--	--	--	0	10.5	0	45	7
1,3 Butadiene	3	3	3	1	--	--	--	0	--	--	--	0	3	3	3	1

Note: This table was taken directly from the December 1981 E & E Remedial Approach Plan.
(Original source of data = SCS Engineers, 1979)

*All entries in ppm except for no. of analyses

An¹: Number of Analyses

5.2.4 Hazardous Characteristics

Many of the materials buried at the Lees Lane Landfill are hazardous substances. Because of the great diversity of chemicals reported to be on site, it would be very time consuming to present a detailed characterization of all the hazardous substances, however, a few examples are listed as follows.

- Ignitability
 - methane
- Reactivity/Incompatibility
 - vinyl chloride
 - dichloroethylene
 - methane
- Persistency
 - chromium
- Toxicity (examples of compounds on site with a Sax Level 3 ranking)
 - dichlorodifluoromethane
 - phenol
 - chromium
 - arsenic

5.3 Source, Quantity, And Concentrations

Four companies; B. F. Goodrich, Harshaw Chemical Company, Rohm & Haas, and Celanese Corporation; have been identified as disposing of 212,400 tons of wastes at Lees Lane Landfill (Table 5-1). The volume of these chemical wastes is estimated at 210,000 yd³ which would equate to an area of 5.2 acres with a thickness of 25 ft. This calculation is of course very crude and is only useful to compare the estimated volume of the chemical wastes relative to the total waste deposit (33 acres) indicated by the magnetometer survey.

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The quantity of municipal waste is unknown. There is no indication of landfill thickness. Reportedly the thickness could be up to 50 ft, which is the approximate depth of the water table. The original sand and gravel pits could have been excavated below the groundwater table; therefore, the waste thickness could be more than 50 ft.

There is very little information on the possible chemical concentrations that occur in the ground. There has been no analysis on liquid or solid wastes in the soil.

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6.0 ENVIRONMENTAL CONCENTRATIONS

6.1 Air

Data acquired from ambient air samples taken inside and outside homes, at the top of monitoring wells, and from sampling probes installed below the ground inside of monitoring wells are compiled under this heading. Results were compiled from testing performed by several groups using field measurements and laboratory analysis of samples.

In early 1975, the presence of an unusual gas was reported in the Riverside Gardens residential neighborhood, east of the Lees Lane Landfill. Samples were taken, and combustible gas was found in the ambient air, inside houses, and in septic tank vents. Laboratory analysis of the gas showed methane to be the major constituent. Readings taken indicated levels of methane high enough to cause an explosion hazard. A second study in 1978 tested the air in 27 homes with methane results found below the level needed to cause an explosion hazard.

Monitoring wells were installed from 1975 to 1980 in the landfill, around the landfill periphery, and within the residential neighborhood. Measurements taken from these wells showed methane concentrations at the top of the casing high enough to cause an explosion hazard. In late 1980, monitoring wells along the landfill boundary were connected to a vacuum blower and vent stack. Gas was collected and vented from these wells in an attempt to intercept gas before it moved under the residential neighborhood. This system is believed to work, but this has not been verified through analysis of air samples. Sampling at the vent confirms methane gas is being collected; however, no study of this venting has been done to determine effects it may have on the local environment.

Air samples from wells have also contained toxic compounds. A summary of these gas analyses is presented in Table 5-2. The list of compounds in Table 5-2 contains known and suspected carcinogens.

Waste drums have been uncovered at the landfill, some containing substances with flashpoints low enough to cause a combustion hazard if released from the drum. Contents of the drums were also found to contain 51 individual compounds identified through chemical analysis. Included were phenolic resins, benzene, copper, cadmium, nickel, lead, and chromium. Release of these toxic materials into the air is possible if a drum is uncovered during excavation or from erosion and fails structurally.

6.2 Soil

The soil presents a complex problem for assessment. The soil particles tend to adsorb organic compounds. The pore spaces can be filled with gas, liquid wastes, or water and miscible wastes.

No soil or sediment analysis is available at this time. The results from sediment (and leachate) samples, collected by Ecology and Environment, Inc. in November 1982, are expected to be available in March 1983.

It is highly probable that some gas (predominantly methane), liquid wastes, and solid wastes are contained in the soil. In addition, wastes buried in drums will eventually enter the soil when the drums rust through.

6.3 Groundwater

6.3.1 Background

The groundwater beneath this site may become contaminated in two ways. The first is by water moving downward through the wastes to the groundwater system. This surface recharge could be in the form of precipitation or by floodwaters of the Ohio River. The second mechanism is by direct contact between the waste and the groundwater, which would occur when the water table is above the bottom of the wastes.

The actual extent of groundwater contamination is difficult to assess from existing data. Very few groundwater analyses are available. Off-site domestic wells were sampled in November and December 1978. Samples were analyzed for volatile organics, selected metals, and TOC (USEPA, March 1979). Five on-site monitoring wells were sampled in April 1981; those samples were subjected to analysis for constituents listed on the Natural Resources Defense Council (NRDC) list of priority pollutants (USEPA, July 1981).

6.3.2 On-Site Groundwater Quality

The on-site samples were collected from monitoring wells LL-1, LL-7, LL-9, LL-10, and LL-11 (Figure 3-1, Table 6-1). It is known that the samples were not filtered and were heavily laden with sediment (E & E Remedial Approach Plan, December 1981). It is possible that the sediment in the samples may have influenced the chemistry of the water by adsorbing constituents or releasing contaminants. However, the analyses may be reasonably valid if the samples were not strongly acidified and if they were analyzed soon after they were collected. (Acid could cause release of contaminants from the sediment. If the samples were allowed to sit long before they were analyzed, reactions between the sediment and the water could have occurred.) With these constraints in mind, a tentative interpretation of groundwater quality can be made.

When the river is at normal stage, groundwater in the alluvial aquifer flows toward the river. Under such conditions, LL-1 monitors background water quality; LL-7 is upgradient of the site; and LL-9, LL-10, and LL-11 are downgradient of the wastes.

During periods of high riverflow, groundwater flow is reversed. The wells which were previously downgradient are then upgradient, and vice versa. LL-1 remains background.

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SUMMARY OF GROUNDWATER QUALITY DATA FROM
ON-SITE MONITORING WELLS
APRIL 1981

	Well No.				
	LL-1 ($\mu\text{g/l}$)	LL-7 ($\mu\text{g/l}$)	LL-9 ($\mu\text{g/l}$)	LL-10 ($\mu\text{g/l}$)	LL-11 ($\mu\text{g/l}$)
<u>Organic Compounds</u>					
Bis (2-ethylhexyl) phthalate*	--	--	--	15	--
Trichlorofluoromethane*	--	--	10K	--	--
Dichlorodifluoromethane*	--	--	10K	--	--
Phenol*	--	--	--	--	32
<u>Inorganic Elements</u>					
Arsenic*	--	140	700	900	120
Boron	920	120	330	420	400
Barium	360	1,310	4,850	19,700	1,340
Beryllium*	--	--	56	168	10
Cadmium*	--	--	15	30	5
Cobalt	20	590	1,040	2,220	140
Chromium*	40	130	900	2,320	180
Copper*	120	380	1,440	2,960	220
Nickel*	80	900	1,580	3,420	280
Lead*	40	--	--	--	160
Selenium*	--	--	400	1,000	100
Tin	--	30	40	30	50
Thallium*	--	--	20	10	--
Vanadium	30	170	1,300	2,420	230
Zinc*	260	830	4,260	10,700	1,120
Mercury*	--	--	2	5	1
Aluminum	12,800	51,200	--	1,920,000	667,000
Manganese	1,910	36,100	37,600	216,000	16,800
Magnesium (mg/l)	46.3	348	482	641	64
Iron (mg/l)	25.8	191	1,750	5,180	297
Sodium (mg/l)	105	14.4	71.4	89.8	32

Notes:

1. Refer to Figure 3-1 for locations of monitoring wells.
2. This table is taken from the December 1981 E & E Remedial Approach Plan.

(*) On NRDC list of priority pollutants

(--) Material was analyzed for but not detected at or above the minimum detection level. The minimum detection level varies from sample to sample and from parameter to parameter.

(K) Compound was identified as present but at a concentration less than detection limits.

REF: EPA, SAD, Athens, GA, 1981

Given this model, LL-9, LL-10, and LL-11 would be expected to be the most contaminated, because they are usually downgradient. However, because of the dispersion of constituents in groundwater and periodic reversals in groundwater flow direction, upgradient wells will always be somewhat contaminated, since they are also sometimes downgradient. It would then be expected that LL-7 would be slightly contaminated even during normal flow, and that LL-9, LL-10, and LL-11 would remain contaminated during reversed flow. In short, any contaminant released by the wastes should be highest in wells LL-9, LL-10, and LL-11; essentially absent in LL-1; and intermediate in LL-7.

This pattern does hold true for arsenic, barium, beryllium, chromium, selenium, thallium, vanadium, zinc, mercury, and iron. If the data are reliable, the groundwater must be contaminated with these ions. LL-10 shows the highest concentrations of most species, possibly indicating a lateral variation in the distribution or type of wastes. Well LL-11 has lower concentrations of some ions which are more abundant in the southern end of the site; these ions include cobalt, copper, nickel, manganese, and magnesium.

All on-site samples were analyzed for base/neutral compounds, volatile compounds, and acid compounds on the NRDC list of priority pollutants, but none were found above detection limits except bis(2-ethylhexyl)phthalate and phenol (Table 6-1). Trichlorofluoromethane and dichlorodifluoromethane were detected in concentrations too small to be quantified (Table 6-1). Lab analysis sheets list acetone, tetrahydrofuran, trimethoxymethane, and a "petroleum-type product" as "tentatively identified compounds." Three "unidentified" compounds were noted in the sample LL-7 (USEPA, July 1981).

6.3.3 Off-Site Private Wells

Analyses of the groundwater samples from private, domestic wells do not show any pattern of concentrations which could indicate contamination (Table 6-2, Figure 6-1). Most values are quite low. One well, PU-519, had high concentrations of many metals. This well is abandoned. The casing of the well itself may be

TABLE 6-2

LEES LANE LANDFILL
SUMMARY OF ANALYSES FROM OFF-SITE DOMESTIC WELLS
NOV. - DEC. 1978

Well	Date Sampled	Start Time	Ending Date	End Time	78C SAD Sample Number	1 Antimony Total µg/l	2 Arsenic Total µg/l	3 Beryllium Total µg/l	4 Cadmium Total µg/l	5 Chromium Total µg/l
HO-508	11/20/78	1745			3300	<25	<25	<10	<10	<10
LE-416	11/20/78	1715			3301	<25	<25	<10	<10	<10
PU-519	11/20/78	1645			3302*	<40	<25	<10	<20	28
WM-408	11/21/78	1039			3303	<25	<25	<10	<10	<10
ME-616	11/21/78	1016			3304	<25	<25	<10	<10	<10
LU-604	11/21/78	0953			3305	<25	<25	<10	<10	<10
WM-422	11/20/78	1800			3306	<25	<25	<10	<10	<10
WL-416	11/20/78	1750			3307	<25	<25	<10	<10	<10
LE-405	11/21/78	0830			3308	<25	<25	<10	<10	<10
PU-503	11/21/78	0845			3309	<25	<25	<10	<10	<10
LU-614	11/21/78	0935			3310	<25	<25	<10	<10	<10
WM-408	12/14/78	1440			3493	<25	<25	<10	<10	<10
WM-422	12/14/78	1430			3494	<25	<25	<10	<10	<10
HO-508	12/14/78	1410			3495	<25	<25	<10	<10	<10
ME-616	12/14/78	2015			3496	<25	<25	<10	<10	<10
PU-503	12/14/78	2045			3497	<25	<25	<10	<10	<10

*3302 - Has a trace of Tin - Approximately 90 µg/l

TABLE 6-2
LEES LANE LANDFILL
SUMMARY OF ANALYSES FROM OFF-SITE DOMESTIC WELLS
NOV. - DEC. 1978
PAGE TWO

Well	6 Copper Total ug/l	7 Calcium Total ug/l	8 Lead Total ug/l	9 Mercury Total ug/l	10 Nickel Total ug/l	11 Magnesium Total ug/l	12 Selenium Total ug/l	13 Silver Total ug/l	14 Strontium Total ug/l	15 Zinc Total ug/l	16 Iron Total ug/l	17 TOC Total mg/l
HO-508	<10	95000	<25	NA	<20	33000	<25	<10	110	3090	<100	<1
LE-416	18	90000	<25	NA	<20	32000	<25	<10	103	309	<100	1.2
PU-519	25570	100000	1144	NA	<40	35000	<25	<20	510	31880	133000	3.2
WM-408	18	129000	<30	NA	<20	44000	<25	<10	164	602	100	2.8
ME-616	20	98000	<25	NA	<20	35000	<25	<10	115	2067	<100	1.0
LU-604	14	95000	31	NA	<20	34000	<25	<10	110	3992	<100	<1
WM-422	12	108000	31	NA	<20	38000	<25	<10	134	881	<100	<1
WL-416	144	124000	121	NA	<20	41000	<25	<10	148	3486	6800	<1
LE-405	13	90000	<25	NA	<20	32000	<25	<10	104	828	<100	<1
PU-503	16	91000	<30	NA	<20	33000	<25	<10	105	769	<100	<1
LU-614	13	100000	<25	NA	<20	36000	<25	<10	121	343	<100	1.3
WM-408	<10	147000	<25	NA	<20	52000	<25	<10	195	903	<100	<1
WM-422	10	100000	<25	NA	<20	35000	<25	<10	123	1128	200	<1
HO-508	<10	92000	<25	NA	<20	32000	<25	<10	108	3595	<100	<1
ME-616	14	100000	<25	NA	<20	36000	<25	<10	118	2108	<100	<1
PU-503	13	90000	<25	NA	<20	32000	<25	<10	105	789	<100	<1

Source: EPA, 3/79

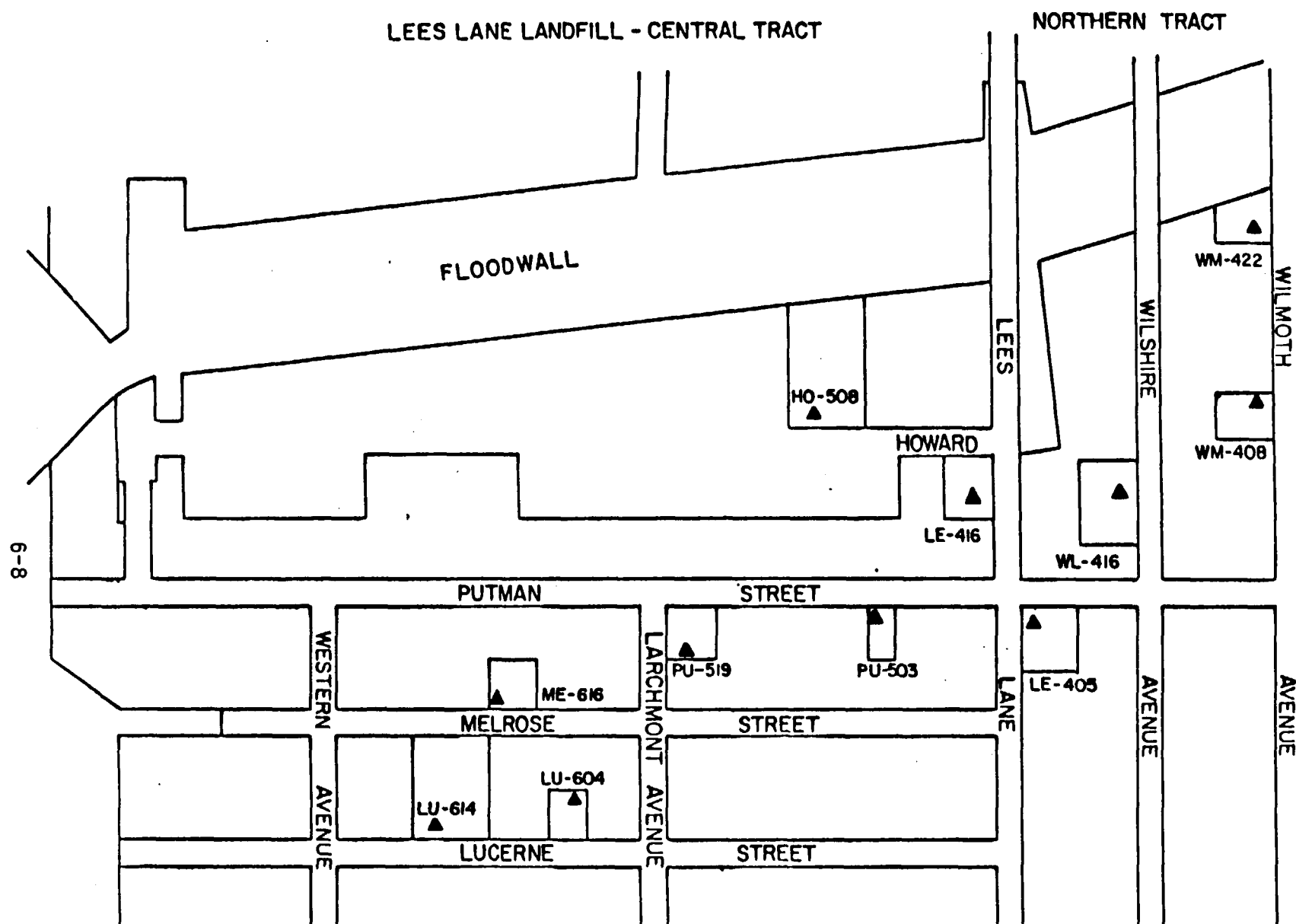
See Figure 6-1 for sample locations.

NA - Not analyzed for.



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LEGEND

HO-508 DOMESTIC WELL LOCATION

SOURCE: EPA GROUNDWATER MONITORING
INVESTIGATION REPORT, DEC., 1978

FIGURE 6-1

LEES LANE LANDFILL DOMESTIC WELL LOCATIONS

SCALE 1" = ~300'



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responsible for some of the dissolved metals (EPA, March 1979). All samples were analyzed for volatile organics and vinyl chloride, but these were not detected in significant concentrations. Existing data do not indicate contamination of existing off-site wells. The extent to which groundwater is being used as a domestic water supply is not known.

6.4 Surface Water

There are no water quality data available which characterize surface waters on the Lees Lane Site or adjacent to it. On November 3, 1982, Ecology and Environment, Inc., collected leachate and sediment samples from seeps along the Ohio River bank. The results of this sampling effort will need to be analyzed during the remedial investigation.

6.5 Biota

There are no data available on pollutant uptake by living organisms in the vicinity of the Lees Lane Landfill.

7.0 PUBLIC HEALTH CONCERNS**7.1 Air Pollution**

The Lees Lane Landfill is emitting air pollutants from operation of the gas venting system. Analysis of gas escaping from monitoring wells has shown the presence of methane as high as 83 percent by volume. Aside from the explosion hazard discussed in Section 7.5, these concentrations may cause death by simple asphyxiation. Toxic organic compounds have also been found in the landfill gas (Table 5-2), including some above their recommended threshold limits, such as vinyl chloride, a known carcinogen; benzene, a suspected carcinogen; dichlorethene, a suspected carcinogen; and toluene (skin exposure hazard). Care must be taken to securely limit access to monitoring wells, venting pipes, and the vent stack to prevent exposure by these routes. Because of the toxic organics found in well gas, the venting of this gas may be a source of concern to the public health. Certainly the contaminants are diluted at the vent, but no data are available to quantify the concentration and movement of the vent plume.

Monitoring data for ambient air within the residential community showed concentrations of combustible gas in 1975 and the opposite in 1979, with no data since then. This needs resolution. The most important areas which need monitoring from a public health standpoint are the affected industrial facilities and residential houses and yards. About 1500 people that live or work within one-mile of the Lees Lane Landfill can be expected to receive the maximum exposure to air contaminants emanating from the site.

7.2 Soil Contamination

There are three possible pollution mechanisms associated with the soil. First, there is the potential for direct contact between contaminated soil and living organisms. Second, soil particles with adsorbed pollutants could be eroded and transported off site. These two mechanisms can not be evaluated until the soil has been tested for contamination.

The third pollution mechanism consists of soil erosion around buried drums, exposure of drums, and subsequent transport by runoff or flood waters into the Ohio River. Erosional cuts along the river bank are well documented, and this presents a serious concern. The steep banks of sandy silt next to the Ohio River are very susceptible to erosion, and areas containing buried drums should be identified and protected from erosion.

7.3 Groundwater Contamination

Contaminated groundwater at this site could become a public health risk in three ways:

- The discharge of contaminated groundwater to the Ohio River could pollute the river.
- Seepage of contaminated groundwater to the ground surface could harm people or animals by direct contact.
- Contaminated groundwater could be drawn into nearby wells.

The last of these mechanisms is the greatest potential problem. Although contaminants have not been found in groundwater off-site (Section 6.3.3), a prolonged high river stage could cause migration of hazardous substances away from the river. Also, the establishment of any new, large pumping centers nearby could alter groundwater flow, and draw polluted groundwater inland.

Table 7-1 is a summary of data from groundwater analyses (Tables 6-1 and 6-2). Many constituents have been detected in high concentrations in the on-site wells, including arsenic, boron, barium, beryllium, cadmium, cobalt, chromium, copper, nickel, selenium, tin, thallium, vanadium, zinc, mercury, aluminum, and manganese.

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TABLE 7-1

LEES LANE LANDFILL
SUMMARY OF GROUNDWATER ANALYSES
SOURCES: USEPA 3/79, USEPA 7/81

<u>Constituent</u>	<u>Range of Concentration (µg/l)</u>	
	<u>On site Wells</u>	<u>Off site Wells</u>
Ag	ND	ND
As	ND-900	ND
B	120-920	NA
Ba	360-19,700	NA
Be	ND-168	ND
Ca	NA	90,000-147,000
Cd	ND-30	ND
Co	20-2220	NA
Cr	40-2320	ND-28
Cu	120-2960	ND-144
Mg	NA	32,000-52,000
Ni	80-3420	ND
Pb	NA	ND-121
Sb	ND	ND
Se	ND-1000	ND
Sn	ND-50	NA
Sr	NA	105-195
Tl	ND-20	NA
V	30-2420	NA
Zn	260-10,700	309-3595
Hg	ND-5	NA
Al	12,800-1,920,000	NA
Mn	1910-21,600	NA
Fe	NA	ND-6800

ND denotes "not detectable"

NA denotes "Not analyzed for"

Note: Analyses from well PU-519 were not included in this data summary;
See Tables 6-1 and 6-2 for analyses from individual wells.

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Organics do not seem to be a problem at this site (Section 6.3). However, this conclusion may be due to misleading data and may not represent the true groundwater conditions.

7.4 Surface Water Contamination

It is not known if the Lees Lane Site is causing any surface water contamination. A major public health concern is downstream use of the Ohio River for drinking water supplies. As mentioned previously, the closest Ohio River downstream intake for a public drinking water supply is located at West Point, Kentucky, approximately 14 miles downstream from the Lees Lane Site.

A second concern involves Mill Creek and the standing water bodies on site. If these surface waters are contaminated, then the potential for direct contact by living organisms becomes a public health concern.

7.5 Fire and Explosion

Explosive levels of methane gas were first reported in March 1975 as causing flash fires around water heater pilot lights. Seven families were evacuated along Putman Street in Riverside Gardens as a result of this hazard. Failure or degrading of the gas venting system or an increase in the rate of gas generation may cause gas inside residences to reach levels at which an explosion may occur. A failure within the gas venting system may also cause the gas in wells, pipes, or blowers to ignite.

A fire and explosion hazard also occurred when 400 drums along the river bank were uncovered by erosion. Sampling of the drum contents resulted in flash point determinations ranging from 77°F to greater than 150°F. The contents of these drums were pumped out and removed in October 1981.

The presence of other buried drums containing low flash point substances remains a possibility. Any action at Lees Lane Landfill dealing with excavation, drum removal, liquid removal, or drilling operations must first deal with the prevention of fire and explosion hazards (E & E Remedial Approach Plan, December 1981).

7.6 General Risk Assessment**7.6.1 Air**

The major air pollutant at the Lees Lane Landfill is methane gas, a combustible gas and a simple asphyxiant. Minor pollutants include the chemicals listed in Table 5-2, several of which are known or suspected carcinogens. Based on the concentrations found in the monitoring wells, the concentrated gas is hazardous.

Exposure to this hazardous gas can occur due to open wells, the gas vent, or from air within building or outdoors. Based on the analytical tests performed within local residences and narrative testimony after the gas venting system was installed, the concentrations of methane in and near the residences fell below 0.1 percent. Using this data, the risk to residential populations near the Lees Lane Landfill is low. However, the quantity and timeliness of the data are not sufficient to place confidence in this conclusion.

Data on the contaminants within the wells and from the vent stack show hazardous concentrations of toxic contaminants. Exposure to these contaminants is possible in the immediate vicinity of open wells or the vent. Securing the well covers to prevent unauthorized opening of the well and use of protective equipment minimizes this risk. Also, the vent stack is fenced to protect against accidental exposure. Implementation of these measures causes the risk to public health from these sources to be low. This conclusion is based on the probability of local air concentrations of the contaminants being quickly diluted to below hazardous levels before exposure by the general public. A lack of data concerning the rate of dilution and plume direction limits the usefulness of this assumption.

7.6.2 Soil

Analytical data on soil contamination are not available; therefore, no conclusions can be made on the risk to public health.

000379**7.6.3 Groundwater**

Data on pollutants in groundwater wells date back to 1978 and are of doubtful validity because of procedural problems in taking samples. If the data are correct, at that time no domestic wells had been affected. However, samples from wells in the landfill showed contamination by toxic metals above that in background wells. The potential exists for this contamination to migrate from the landfill to domestic wells. Since this had not yet occurred in 1978, the risk to public health was low at that time. Without additional data from current domestic wells, assessing the current risk is not possible.

7.6.4 Surface Water

Analytical data on surface water contamination are not available; therefore, no conclusions can be made on the risk to public health.

8.0 EVALUATION OF EXISTING INFORMATION**8.1 Adequacy of Technical Data**

Table 8-1 presents an inventory and brief evaluation of the major technical data sources (with respect to Quality Control and Quality Assurance) available to the authors of this RAMP. This table is divided into two sections; the first is Section A which includes all data for which some form of QA/QC or Chain-of-Custody was used, and the second is Section B which includes the data for which it is not known whether QA/QC or Chain-of-Custody was used. The criteria for inclusion in Section A include specific QA/QC factors such as; document control, sample Chain-of-Custody, instrument calibration, sampling techniques, sample preservation, testing procedures, and data reporting.

8.2 Identification of Additional Data Needs**8.2.1 Air**

Proper air monitoring should be conducted during any on-site drilling operations.

8.2.2 Soil

The following data are lacking, and should be obtained during the remedial investigation.

- Site topography. Location of contours, geophysical survey reference points and monitoring wells.
- Soil contamination data.
- Chemistry of subsurface soils.
- Better definition of area, depth, and thickness of subsurface waste deposits.

TABLE 8-1
LEES LANE LANDFILL
ANALYTICAL RESULTS DATA SUMMARY

Section A: Data for which some form of QA/QC or Chain-of-Custody was used.

Technical Data Source No.	Date	Type	Analysis	Comments
(6)	July 1975	Gas samples	Explosive gases	Sampling and analysis
(8)	July 1978	Gas samples	Explosive gas (methane)	Calibration of gas scope and explosimeter mentioned
(12)	December 1978	Gas/groundwater samples	Volatile organics	Sampling of private wells
(13)	December 1978	Gas samples	Exotic gas	Gas standards and calibration of gas meters mentioned
(15)	December 1978	Gas samples	Combustible gases	Limited QC reference to calibration and corroboration with second instruments
(16)	February 1979	Gas samples	Combustible gases	QC includes; calibration, sampling blanks, detection limits, replicate and verification
(17)	March 1979	Groundwater	Volatile organics	Data was qualitatively useful. QA/QC programs were in effect
(20)	April 1980	Drum samples	Organics	Calibration of GC/MS documented
(23)	July 1981	Groundwater samples	Organics inorganics	Standard procedures and QA manual documented. Sample custody and shipping information included
(30)	November 1982	Water/Soil samples	Organics and metals	Limited mention of QA/QC

TABLE 8-1
LEES LANE LANDFILL
ANALYTICAL RESULTS DATA SUMMARY
PAGE TWO

Section B: Data for which it is not known whether QA/QC or Chain-of-Custody was used.

Technical Data Source No.	Date	Type	Analysis	Comments
(1)	1945	Well logs	NA	Geological data
(2)	April 1975	Air samples	Organics	Found were unquantified amounts of methane, vinyl chloride, carbon dioxide
(3)	April 1975	Cross-sectional drawing of levee	NA	
(4)	April 1975	Test of well gas	Well head pressure	
(5)	May 1975	Gas samples	Organic compounds	Water samples taken but not identified
(7)	July 1978	Gas samples	Organics	Found were vinyl chlorides and methane
(9)	August 1978	Estimate of methane recovery	NA	
(10)	September 1978	Gas samples and boring logs	Organics	Geological data
(11)	September 1978	Gas samples	Methane	High levels of methane gas were found around the site parameter
(14)	December 1978	Gas samples	General air	
(18)	February 1980	Sketch	NA	Location of drums

TABLE 8-1
LEES LANE LANDFILL
ANALYTICAL RESULTS DATA SUMMARY
PAGE THREE

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Technical Data Source No.	Date	Type	Analysis	Comments
(19)	April 1980	Drum samples	Flash point	All flash points were above 75°F
(21)	February 1981	Emergency action plan		NA
(22)	February 1981	Site Drawings	NA	
(24)	December 1981	Surface/Ground- water samples	Organics/inorganics	
(25)	March-June 1982	Magnetometer data	NA	Geologic Data
(26)	June 1982	Correspondence	NA	Re: Magnetometer survey
(27)	July 1982	Eligibility and information package	NA	
(28)	July 1982	Correspondence	NA	Re: Resistivity study
(29)	August 1982	Monitoring well bid specs.	NA	Data was useful in deriving need for further boring and soil sampling
(31)	1982	Blueprints	NA	Geophysical study results
(32)	1982	Mitre model work sheets	NA	
(33)	No date	Drum samples	Organics	Tentative identification of 50 compounds
(34)	No date	Eckhardt report	NA	Generator listing

NA: Not applicable

NOTE: For a listing of technical data sources, refer to the section entitled "References" later in this report.

000384**8.2.3 Groundwater**

There are many problems with the existing groundwater-monitoring network. Logs of most of the wells are unavailable, so construction details and nature of the monitored zone are unknown. Drilling fluids used are not known; some fluids may contaminate the hole with metals or organics, while clay-mud fluids may remain in the alluvium and adsorb cations and polar organic compounds. At least some of the wells are constructed of PVC, which may adsorb organics.

Water levels have not been measured in most wells. Data on water level changes through time are not available for most wells. River stage was not recorded with water level measurement; this data is necessary because of the hydraulic connection between the alluvium and the River. Elevations of most wells are unknown, so water levels cannot be converted to water-table elevations.

Information on preservation of groundwater samples is incomplete. Details of how the monitoring wells were purged are also incomplete.

The following data should be collected during the remedial investigation.

- Reevaluation of existing wells and existing well data (this includes the wells which will be drilled between February and April, 1983).
- More complete information on groundwater flow regime and extent of groundwater contamination.
- River gauging data and corresponding groundwater level data.
- Water quality data from off-site wells.

In addition, a survey of off-site well usage is needed. This is recommended as an initial remedial measure.

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8.2.4 Surface Water

The following data should be collected during the remedial investigation.

- Review and evaluation of the November 1982 leachate and sediment sample analysis (available as of March 1983).
- Surface water and sediment quality data.

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9.0 HEALTH AND SAFETY PROCEDURES

9.1 Level of Protection Used in Previous Investigations

Level D protection has been used in the past. Recommended elements of Level D protection are identified in subsection 9.3.

9.2 Past and Present Site Monitoring Methods and Data

Health and safety monitoring methods which have been used at the Lees Lane Landfill are:

- radiation survey meter
- HNU photoionizer
- magnetometer survey
- resistivity survey

The HNU and radiation surveys conducted on March 8, 1981, did not detect organic vapor levels or radiation levels above background levels.

9.3 Level of Protection Recommended for Future Work

Level D protection is recommended for site monitoring activities. The recommended elements of Level D protection are:

- disposable coveralls
- rubber boots, metal-toe safety shoes
- safety glasses with side shields
- hard hat
- disposable gloves
- full mask air purifying respirator (to be carried) or Robertshaw Escape Pack

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Level C protection is recommended when activities require surface soil to be broken. The recommended elements of Level C protection are:

- disposable coveralls
- rubber boots, metal-toe safety shoes
- safety glasses with side shields
- hard hat
- disposable hood
- inner and outer gloves
- full mask air purifying respirator with GMC (combination) cartridge
- Robertshaw Escape Pack

Level B protection is recommended for all drum removal operations where it is found that personnel may be at risk from vapors emitted from leaking (deteriorated) drums. The recommended elements of Level B protection are:

- self-contained breathing apparatus
- chemical-resistant coveralls
- cotton underwear
- neoprene boots with steel toe and shank
- butyl rubber booties
- butyl rubber or neoprene gloves
- surgical gloves
- hard hat with face shield*
- butyl rubber apron, ankle length with sleeves*
- face and eye protection

*optional

Level A protection is recommended for all drum opening and sampling activities. Maximum dermal protection must be used when opening (or sampling) drums that have unknown contents, are under pressure, or are shock sensitive. The recommended elements of Level A protection are:

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- self-contained breathing apparatus
- CP 2000 East Wind encapsulated suit
- cotton coveralls, white
- cotton underwear
- surgical gloves
- neoprene boots with steel toe and shank
- booties, butyl rubber or polyvinyl chloride
- gloves, disposable* (additional pair)
- booties, disposable* (additional pair)
- hard hat*

*optional

9.4 Site Monitoring Recommended for Future Work

The following monitoring equipment is recommended for future on-site activities as appropriate:

- radiation survey meter
- HNU photoionizer
- explosivity/O₂ meter
- magnetometer and resistivity meters as needed

000389**10.0 REMEDIAL ACTION PLANNING ACTIVITIES****10.1 Preliminary Objectives and Criteria**

The overall objective of the remedial planning process is to identify the most cost effective means of adequately resolving the environmental contamination and public health concerns associated with the Lees Lane Landfill. Sections 1 through 9 in this ramp were directed primarily at defining the extent of the problem. Sections 10 through 13 map out the proposed remedial activities for dealing with the problem.

An immediate problem exists in the northern tract of the site; where approximately 25 drums of waste are located. These drums have deteriorated with time, and are now leaking. A noticeable organic odor is present near the drums. The primary concerns associated with these drums are the elimination of direct contact with the chemicals, as well as preventing further leakage into the soil and groundwater.

The air pollution problem (landfill generation of methane and other gases) is well documented, and remedial actions have already been implemented (installation of gas venting system in 1980). The main thrust in this area is maintenance of the venting system and implementation of a long-term monitoring program.

The groundwater directly beneath the Lees Lane Site appears to be contaminated with several inorganic elements and possibly with organic constituents. The small amount of data collected to date indicates that the groundwater off-site does not appear to be contaminated at this time. Both of the foregoing conclusions are preliminary, and must be confirmed or denied with additional groundwater testing. The major emphasis with respect to groundwater is the collection of additional data and long-term monitoring.

It is unknown at this time if the surface soil at the Lees Lane Site is contaminated. It is reasonable to assume that the old landfill operation was covered by clean material, and therefore the probability of surface soil contamination is small.

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Additional data are needed to better define the location of the buried waste and to determine if the surface soil is contaminated.

Erosional cuts developing along the Ohio River bank may eventually expose chemical waste drums, creating an obvious pollution threat to the Ohio River. River bank erosion control measures should therefore be investigated.

At this time, there are no data to indicate if any of the surface waters on the Lees Lane Site or next to it, are contaminated because of the wastes buried there. Testing is needed in this area to establish the presence or absence of a surface water pollution problem.

10.2 Preliminary Identification of Remedial Responses

Four categories of remedial responses are identified in this section; initial remedial measures, remedial investigation, long-term remedial responses, and post closure monitoring and maintenance. The various responses are discussed in greater detail later in Section 10 and in Appendix B (Work Plan Outlines).

It is important to note that the remedial responses identified are based on the assumption that there are no current plans to develop the Lees Lane Site into any type of a public access facility.

Initial Remedial Measures:

- Implement a long-term preventive maintenance (PM) program for the existing gas venting system.
- Initiate a long-term air monitoring program at the exhaust of the gas venting blower and in/around selected residences near the site.
- Conduct a survey of existing off-site well usage.

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- Install warning signs around the perimeter of the site.
- Remove approximately 25 drums found on site in February 1983.

Remedial Investigation:

- Air monitoring during on-site drilling
- Groundwater sampling program
- Soil sampling program
- Surface water and sediment sampling program.

Long-Term Remedial Responses:

- Erosion control measures along the Ohio River bank
- "No Action Alternative"

(Under this scenario, no long-term responses per se would be implemented; however, the initial remedial measures and the post closure maintenance and monitoring recommendations would be implemented.)

Note: Other long-term remedial responses may or may not be identified after the remedial investigation is completed.

Post Closure Maintenance and Monitoring:

- Long-term preventive maintenance program for the existing gas venting system. (It is recommended that this activity be implemented as an Initial Remedial Measure.)
- Inspection and maintenance of warning signs and erosion control measures along the Ohio River bank.

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Long-term air monitoring program. (It is recommended that this activity be implemented as a Initial Remedial Measure.)

- Long-term groundwater monitoring program.

10.3 Initial Remedial Measures

10.3.1 Objectives

There are four distinct objectives to be accomplished by initial remedial measures (IRMs):

- Insure that methane and other gases being generated by the landfill are properly vented and not permitted to enter the homes in Riverside Gardens.
- Determine the extent of current off-site well usage.
- Make the general public aware of the hazardous substances buried at the Lees Lane Landfill by posting signs.
- Eliminate the threat of a hazardous substance release by removing approximately 25 drums remaining on site.

The five proposed IRMs are discussed below.

10.3.2 Remedial Investigations

None of the five IRMs require any remedial investigation.

10.3.3 Engineering Feasibility Studies

None of the five IRMs require a feasibility study.

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10.3.4 Design

10.3.4.1 Gas Venting System PM Program

Design of this IRM would consist of defining a long-term PM program for the existing gas venting system.

10.3.4.2 Long-Term Air Monitoring

The major elements of the air monitoring program would include sample locations, sampling techniques, monitoring parameters, and sampling frequency.

10.3.4.3 Survey of Existing Off-Site Well Usage

Design of this IRM would include identification of informational needs, determination of area to be surveyed, and identification of survey techniques.

10.3.4.4 Installation of Warning Signs

The major elements of design would consist of preparing a fabrication specification and deciding on the spacing interval between signs.

10.3.4.5 Drum Removal

There are no specific design requirements for this IRM.

10.3.5 Implementation

10.3.5.1 Gas Venting System PM Program

To implement the PM program, two major decisions would be required. The first decision is to determine who would implement the program and perform the routine maintenance work. Secondly, a determination would be required on whether there is a need for some type of government reporting and review mechanism to insure that the PM program is adhered to.

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10.3.5.2 Long-Term Air Monitoring

To implement the air monitoring program, two major decisions would be required. The first decision is to determine who would implement the program and perform the monitoring activities. Secondly, a determination would be required on whether there is a need for some type of government reporting and review mechanism to insure that (1) the monitoring program is adhered to, and (2) proper action is taken if an air quality problem is identified.

It is important that this program be implemented before the remedial investigation and feasibility study. The results from (at least) the first set of air samples will be necessary to evaluate long-term remedial responses at the Lees Lane Site.

Because the air monitoring program includes monitoring at private residences, community relations must be adequately addressed before performing the work.

10.3.5.3 Survey of Existing Off-Site Well Usage

It is important that this survey be conducted before the remedial investigation and feasibility study. The results from this survey will be necessary to evaluate long-term remedial responses at the site.

The well survey may involve direct contact with residential and industrial well users; therefore, community relations must be adequately addressed before conducting the survey.

10.3.5.4 Installation of Warning Signs

Implementation of this IRM would consist of sign fabrication and installation.

Some type of community relations effort prior to sign installation should be considered.

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10.3.5.5 Drum Removal

The initial phase of this IRM consists of the procurement of a contractor to sample and remove the 25 drums remaining on site. Once contractor selection is complete, work will begin with a sampling and analysis program.

Level A personnel protection (described in Section 9.3) will be used during the drum sampling phase. After the results are obtained from the samples, two major decisions will be made. The first decision will be to choose the level of personnel protection required for the remainder of the work. And secondly, a method of disposal will be chosen according to the disposal requirements for the wastes detected.

Technical supervision will be provided during all phases of work on the project. The function of this supervision is to provide solutions to any technical, safety, or community relations problems that may arise. On-site supervision will also be conducted to assure adherence to appropriate quality control guidelines.

10.4 Scope of Remedial Investigations

The major elements of the remedial investigation are listed below for each of the four environmental pathways. Every effort should be made to ensure that complete and valid data are obtained in all future investigative sampling efforts.

10.4.1 Air

No structured air sampling program per se is recommended for the remedial investigation. However, appropriate air monitoring techniques should be utilized during any on-site drilling operations.

10.4.2 Groundwater

The first step of the groundwater investigation will be the reevaluation of existing monitoring wells to determine their usefulness as monitoring points. Well logs and

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construction details should be located if available. A field inspection of the wells will be made, and the following will be noted: well integrity/repair, materials of construction, water level, water level recovery after bailing, and any other features which could affect the well's utility as a monitoring point. It will then be decided if the well is useful as a monitoring point. It is possible that a well may be useful for water levels but not for samples. This investigation will also include data from wells to be drilled between February and April 1983.

After the existing wells have been evaluated, new monitoring wells will be installed to create a complete groundwater-monitoring network. Three to five holes are planned for this installation. This figure may be revised downward if existing wells can be used. Well locations will be determined, in part, on the basis of geophysical information and accessibility. The new installations will be monitoring-well nests--multiple wells of differing depths emplaced in a single hole. This arrangement will allow for the investigation of the vertical component of the hydraulic gradient and of vertical variations in groundwater quality. During drilling, split spoon samples will be taken to allow for examination of the alluvium. Formal boring logs will be prepared. Water levels will be measured in the wells and groundwater samples collected soon after completion. Water levels and samples should be collected periodically thereafter.

Because of the effect of river stage on groundwater levels, river gaging information must be collected. An investigation will be conducted to determine if a gaging station has been established within a reasonable distance of the site. If not, a station will be constructed and monitored.

Any known private wells within one-half mile of the site will be sampled to determine the existence of contamination beyond the site boundaries. To examine the "worst case" groundwater quality, samples should be collected after a prolonged period of high river stage, such as a lengthy flood or the spring snowmelt. Water levels in the wells will also be measured. If contamination is found, chosen wells will be monitored periodically. Attempts will be made to locate construction information on domestic wells.

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All wells in which water levels are measured must be surveyed to determine elevation.

If downward groundwater flow and contaminant migration are found, the deeper carbonate aquifer must be investigated. Plans for this phase will not be discussed now.

10.4.3 Soil

Data is needed in this area to better define waste location, and to determine if the surface soil is contaminated.

First, there is the need to establish a good ground control grid network and to produce an accurate large scale topographic map of the site from aerial photographs. This map is needed to determine areas of soil slope that could be subject to erosion and to accurately tie other information (geophysical, etc.) to ground location.

Second, any areas of suspected surface soil contamination should be sampled. One such area has already been identified during the Phase I magnetometer survey. To completely cover the site, probably 50 to 100 samples would have to be analyzed. Using geophysical indicators, this number can probably be cut to 25.

Third, during the proposed monitoring well installation program, soil samples should be taken and analyzed for TOC (total organic carbon) solvent extractibles, specific gravity, oil and grease, and grain size..

Fourth, a reevaluation of existing geophysical data using computer modeling techniques should be conducted. The boring and down-hole resistivity information which will be obtained during the February-April 1983 monitoring well installation program, should be useful in further defining the surface resistivity data which exists.

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Fifth, if reevaluation of existing geophysical data does not yield necessary definition of the depth and thickness of the waste deposits then a high resolution magnetometer survey (sensitivity ± 0.02 gammas) with diurnal variation corrections should be run. Also, further resistivity surveys may be helpful in determining the extent of contamination.

10.4.4 Surface Water

The recommended surface water sampling program is a minimum plan for establishing the extent (if any) of surface water contamination. It is suggested that three sets of surface water samples be taken, separated by approximately two-month intervals. Each surface water sample should be accompanied by a corresponding sediment sample. The sampling program should not be conducted when water freezing might be a problem.

10.4.5 Ohio River Benthic Ecosystem Study

Conduct studies to determine if the Ohio River benthic ecosystem is being adversely affected by the Lees Lane Landfill.

10.5 Scope of Engineering Feasibility Studies

10.5.1 Erosion Control Along Ohio River Bank

To prevent transport of contaminated surface soils and the unearthing of buried drums, surface erosion should be prevented. There are several storm-water conditions which should be considered. First, there is overland and rill flow. Second are the flood erosion conditions caused by either the Ohio River or Mill Creek flooding. Third, erosion could be caused by "rapid drawdown" after a flood. All of these conditions should be analyzed from a very conservative point of view, since the unearthing of drums could have very serious effects. There are two general land forms at the Lees Lane Site that require different types of erosion prevention design: low slope and moderate to steep slope.

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The low-slope areas need a minimal amount of erosion control. However, inspection and maintenance is a serious part of the long-term plan. The vegetative growth should be controlled to allow for inspection of the low-slope areas. Thick brush and tree cover would obscure new subsidence pits and gas vent areas. Probably grading and seeding with a suitable grass would offer the best erosion control and maintenance solution in the low-slope areas.

The moderate to steep slopes will require a more detailed analysis. Depending on the soil erodibility, the exact percent of grade to be considered in this category will have to be determined. Some thought and soil testing effort will have to go into establishing criteria for the flood and rapid drawdown conditions. Depending on the soil properties and costs of remedial materials, various alternatives including rip-rap facing and use of geotextiles will be considered.

10.5.2 "No Action Alternative"

As previously stated in Section 10.2, this scenario assumes that no long-term responses per se would be implemented; however, the IRMs and post-closure maintenance and monitoring recommendations would be implemented.

No feasibility study is required for this alternative.

10.6 Scope of Remedial Action Design

10.6.1 Erosion Control Along Ohio River Bank

Based on the results of the feasibility study, one or more erosion control measures will have been selected prior to design.

The design stage will consist of selection of final design criteria, preparation of construction drawings and specifications, and presentation of detailed construction cost estimates.

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10.6.2 "No Action Alternative"

No design is required for this alternative.

10.7 Scope of Remedial Action Implementation

10.7.1 Erosion Control Along Ohio River Bank

Implementation will consist of selection of a qualified contractor, followed by actual construction.

10.7.2 "No Action Alternative"

It is assumed that the recommended IRMs and post-closure maintenance and monitoring will be implemented.

10.8 Scope of Post Closure Maintenance and Monitoring Program

Several long-term maintenance and monitoring requirements are recommended here, but a detailed definition of the specific requirements will not be possible until much later in the remedial planning process.

10.8.1 Maintenance

- Long-term preventive maintenance program for the existing gas venting system. (It is recommended that this activity be implemented as an IRM.)
- Maintenance/replacement of warning signs. Periodic inspection of erosion control measures along Ohio River Bank.

10.8.2 Monitoring

- Long-term air monitoring program. (It is recommended that this activity be implemented as an IRM.)

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- Long-term groundwater monitoring program. The monitoring wells installed under this investigation, any other existing monitoring wells deemed useful, and selected private wells should be sampled on a quarterly basis for one year. Water levels should be measured before each sample is collected. Monitoring wells will be purged using a sampling pump before collecting the sample. The timing of the sampling should be adjusted so as to accurately characterize the groundwater quality under conditions of both normal and reversed flow, i.e., samples should be collected after a prolonged period of high or low river stage, and never while river stage is changing or immediately thereafter. If at all possible, the sampling program should be initiated at a time of reversed groundwater flow. Monitoring after the first year should continue on a semi-annual basis for at least ten years.

The need for a long-term surface water monitoring program cannot be addressed until the results of the remedial investigation are available. If the remedial investigation demonstrates the absence of a surface water pollution problem, then long-term surface water monitoring will probably not be necessary.

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11.0 MASTER SITE SCHEDULE

The schedule for the implementation of all remedial activities recommended for the Lees Lane Site is shown in Figure 11-1.

The schedule proposed in Figure 11-1 assumes that erosion control along the Ohio River bank is the only long-term remedial response to be investigated. If the remedial investigation leads to the identification of additional long-term remedial responses, then the schedule may require modification.

This schedule begins following EPA approval of this RAMP and work authorization from EPA to an approved contractor. EPA and Kentucky DEP reviews, estimated to require approximately one month, are included where appropriate.

It is emphasized that the schedule in Figure 11-1 is only a preliminary planning schedule. The schedule was not developed from detailed or highly accurate information, and it should only be used for general planning purposes.

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INITIAL REMEDIAL MEASURES

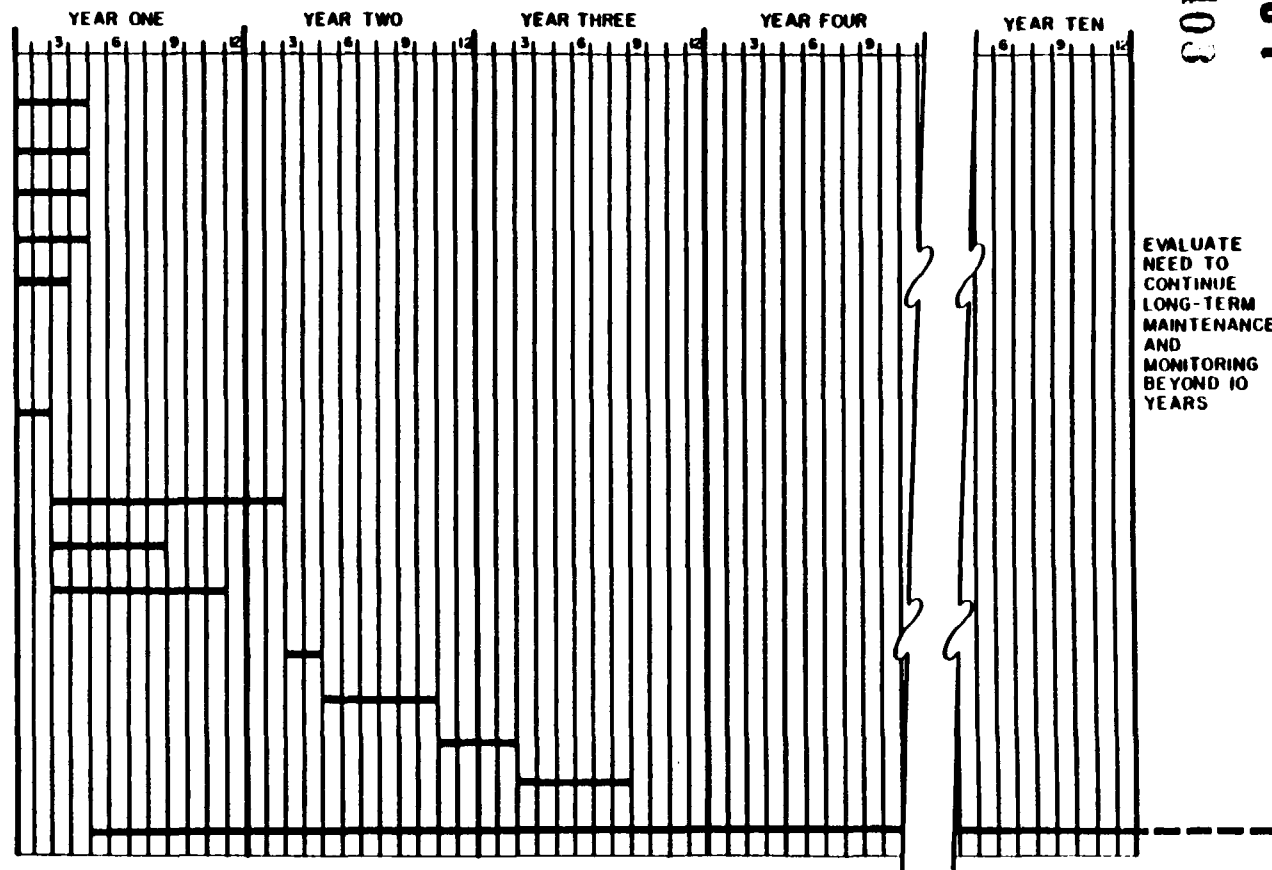
1. GAS VENTING SYSTEM PM PROGRAM
2. INSTALLATION OF WARNING SIGNS
3. SURVEY OFFSITE WELL USAGE
4. LONG-TERM AIR MONITORING PROGRAM
5. DRUM REMOVAL OPERATION

LONG-TERM REMEDIAL MEASURES

PREPARATION AND EPA APPROVAL OF
REMEDIAL INVESTIGATION/FEASIBILITY
STUDY WORK PLAN

1. REMEDIAL INVESTIGATION
 - A. GROUNDWATER
 - B. SOIL
 - C. SURFACE WATER
 - D. REMEDIAL INVESTIGATION REPORT
2. FEASIBILITY STUDY (I)
3. REMEDIAL ACTION DESIGN
4. REMEDIAL ACTION IMPLEMENTATION
5. LONG-TERM MAINTENANCE AND MONITORING

11-2



NOTE: A ONE MONTH EPA/STATE REVIEW PERIOD IS INCLUDED WHERE APPROPRIATE.

- (I) FEASIBILITY STUDY SCHEDULE ASSUMES THAT EROSION CONTROL ALONG OHIO RIVER BANK IS THE ONLY LONG-TERM REMEDIAL RESPONSE TO BE EVALUATED. IF THE REMEDIAL INVESTIGATION LEADS TO THE IDENTIFICATION OF ADDITIONAL LONG-TERM RESPONSES, THEN THE SCHEDULE OF THE FEASIBILITY STUDY MAY NEED REVISION.

LEES LANE LANDFILL-LOUISVILLE, KY.
REMEDIAL ACTION SCHEDULE

FIGURE 11-1

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12.0 COST ESTIMATES FOR REMEDIAL ACTIONS

The costs for the proposed remedial actions at the Lees Lane Landfill are presented in Table 12-1. The costs for design, construction, and long-term maintenance, and monitoring will be developed and presented in the feasibility study.

In most cases, unit costs and other rough estimating techniques were used. These costs should be used for general planning purposes only. The cost estimates in Table 12-1 are based on January 1983 dollars.

A further breakdown of the Table 12-1 cost estimate is presented in Appendix C.

LEE 001**000405****TABLE 12-1**

**LEES LANE LANDFILL
PLANNING COST ESTIMATES FOR REMEDIAL ACTIONS
(JANUARY 1983 DOLLARS)**

	<u>Cost Range</u>	
	<u>Low</u>	<u>High</u>
A. Initial Remedial Measures		
1. Gas venting system PM program ⁽¹⁾	\$ 6,000	\$ 15,000
2. Installation of warning signs	13,000	20,000
3. Survey of off-site well usage	5,000	10,000
4. Long-term air monitoring program ⁽²⁾	6,000	15,000
5. Remove approximately 25 drums	<u>16,000</u>	<u>26,000</u>
Total IRMs	\$ 46,000	\$ 86,000
Total IRMs excluding CLP Costs	\$ 46,000	\$ 86,000
B. Remedial Investigation (RI)		
1. Work Plan Preparation	\$ 20,000	\$ 30,000
2. Initial RI Activities	20,000	30,000
3. Other RI Activities		
a. CLP Laboratory Analyses	120,000	190,000
b. Non-CLP Laboratory Analyses	20,000	30,000
c. Other RI Activities	<u>225,000</u>	<u>315,000</u>
Total RI	\$405,000	\$ 595,000
Total RI excluding CLP Costs	\$285,000	\$ 405,000
C. Feasibility Study		
1. Work Plan	\$ 10,000	\$ 15,000
2. CLP Laboratory Analyses	0	0
3. Non-CLP Laboratory Analyses	5,000	10,000
4. Other FS Activities	<u>80,000</u>	<u>100,000</u>
Total FS	\$ 95,000	\$ 125,000
Total FS excluding CLP Costs	\$ 95,000	\$ 125,000
TOTAL RIFS AND IRMS	\$546,000	\$ 806,000
TOTAL RIFS AND IRMS EXCLUDING CLP COSTS	\$426,000	\$ 616,000

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TABLE 12-1
LEES LANE LANDFILL
PLANNING COST ESTIMATES FOR REMEDIAL ACTIONS
(JANUARY 1983 DOLLARS)
PAGE TWO

	Cost Range	
	Low	High
D. Remedial Measure Design	*	*
E. Remedial Measure Implementation	*	*
F. Maintenance and Monitoring	*	*

*These costs will be developed in the feasibility study.

CLP: EPA Contract Laboratory Program

- (1) Includes design of a PM program and the cost of setting it up. Does not include the annual cost of the PM program.
- (2) Includes design of the air monitoring program and the cost of setting it up. Does not include the annual monitoring cost.

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13.0 COMMUNITY RELATIONS ASSESSMENT

13.1 History of Public Involvement

In March of 1975 when methane was found to be leaking into homes near the Lees Lane Landfill, public involvement literally and figuratively became explosive. The evacuation of families in the Riverside Gardens area brought the landfill to full public view as evidenced by the numerous newspaper articles on the subject.

A second, but less intense, surge of public interest occurred in February 1980 when approximately 400 exposed drums were discovered on the Ohio River bank adjacent to the landfill. Concern was voiced over the threat that these drums of chemical wastes posed to the river as a water supply and also because of the low flash points characteristic of some of the chemicals.

In October 1980, the methane problem was alleviated by a gas venting system. As the methane dissipated, so did citizen interest. Similarly, removal of the exposed drums along the Ohio River in October 1981 eliminated the need for public concern.

Other concerns that received public attention were the frequent fires in the landfill and alleged midnight dumping that occurred after restrictions were placed on the landfill.

13.2 Community Relations Concerns

Currently, the level of public interest in the Lees Lane Landfill is considered to be low. This is due to the removal of the immediate threat to public safety with the installation of the gas venting system and the drum removal operation.

Nonetheless, there is great potential for public involvement to rekindle. This will be especially true when the decision on remedial action is announced.

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The residents do not seem to be prone to irrational excitement. However, they have experienced first-hand the influence the landfill can have on their lives and its potential threat to their safety. These citizens can be expected to be very interested in what action is to be taken.

In addition to the concern of residents in the immediate vicinity, interest can also be anticipated from citizens downstream who use the Ohio River as a water supply. Similar attention may also come from industries which use river water in manufacturing processes that may be affected by contamination.

13.3 Community Relations Objectives

The community relations (CR) program must be designed to provide the media and interested individuals and groups, with current and accurate information on progress at the site. An aggressive information program will forestall rumors, reduce inaccuracies in the media, and provide the facts to all involved officials so that they can respond to inquiries.

The community relations program will also serve to take the pulse of citizen interest. With this information, the community relations personnel can respond to the needs of the public before the situation becomes unmanageable.

In addition, the CR program will serve to support technical activities at the site during IRMs, data collection, and implementation of long-term remedial measures.

13.4 Community Relations Techniques

Because of the potential for public interest to fluctuate considerably, the community relations plan must remain flexible throughout the project. An additional need for flexibility comes from the fact that the community relations program must dovetail with technical progress at the site. Therefore, community relations activities and scheduling may have to change as the technical work evolves.

The following is a list of techniques that may be used as part of the community relations program:

- On-site interviews
- Informal public consultations
- Formal public meetings
- Press releases
- Press conferences
- Fact sheet development

All of these techniques may not be used in conjunction with work at this site. However, such decisions will be made as the level of public interest changes and work progresses.

13.5 Interested Parties

Persons who were active during the methane problem are logical possibilities for showing further concern during site remediation. However, due to the amount of time that has lapsed since that issue was prominent, the interest of the individuals involved needs to be reassessed.

Enno T. Sauer was chairman of the Lees Lane Landfill Advisory Committee and should be contacted concerning the status of that committee. Another group, Lees Lane Task Force, was reported by John Brooks of the Kentucky DEP to have disbanded several years ago.

In addition to the names and addresses needed for persons in the immediate vicinity of the landfill, there is another community with a potential for involvement in site activities. West Point, Kentucky, is the next town down the Ohio River which uses the river for its water supply. If technical information indicates a possibility for contamination of that water supply, community interest there will have to be assessed. A community relations assessment at this time would be premature and might cause needless alarm.

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Following is a preliminary list of individuals who should be kept informed of remedial action developments at the Lees Lane Landfill. This list will need to be updated.

Paul Baskette
Community Development Office
710 West Main Street
Louisville, Kentucky 40202

John Brooks
Kentucky DEP
Division of Waste Management
400 E. Gray Street
Louisville, Kentucky 40202
(502) 588-4254

Barry Burrus
Kentucky DEP
Division of Waste Management
18 Reilly Road
Fort Boone Plaza
Frankfort, Kentucky 40601
(502) 564-6716

Charlie David
Planning and Zoning
900 Fiscal Court
Louisville, Kentucky 40202

Bruce Lane
Clark Bledsoe
Louisville-Jefferson County Health Department
400 E. Gray Street
Louisville, Kentucky 40202

Bruce Miller
County Attorney's Office
216 S. 5th Street
Louisville, Kentucky 40202

Bob Offut
Jefferson County Air Pollution Control Board
914 E. Broadway
Louisville, Kentucky 40204

Don Ridings
Jefferson County Judge's Office
Jefferson County Court House
Louisville, Kentucky 40202

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Ed Robinson
Jefferson County Works Department
601 Fiscal Court Building
Louisville, Kentucky 40202

Enno T. Sauer
Chairman
Lees Lane Landfill Advisory Committee
2317 Clarkwood Road
Louisville, Kentucky 40207
(502) 893-3726

Jo Anne Schlatter
(Spokesperson for Riverside Gardens Homeowner's Association)
4423 Wilshire Avenue
Louisville, Kentucky 40216
(502) 447-6044

REFERENCES

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Report on Findings to Date Regarding Methane Gas Migration Adjacent to the Lees
Lane Landfill. (11)

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Landfill. (12)

No author, December 14, 1978. Study Plan; Lees Lane Water Sampling No. 2;
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Ecology and Environment, Inc., December 14, 1981. FIT Remedial Approach Plan, IDD F4-8109-08A, Appendix: Analysis of Drum Samples, Site Chronology 3/13/75-10/81, Community Relations Consideration, Community Relations Development Plan, Mitre Ranking Forms, List of Selected Wells, Summary of Air Quality Data, Methane, Vinyl Chloride. (24)

Ecology and Environment, Inc., March 1982 to June 1982. Resistivity and Magnetometer Raw Data. (25)

Harman and Templeton, June 4, 1982. Letter to Richard Stonebraker, Referencing Magnetometer and Resistivity Survey Information. (26)

No author, July 2, 1982. Expanded Eligibility Information Package: EPA Site Inspection and Mitre Model Bibliography. (27)

Harman and Templeton, July 9, 1982. Letter to Richard Stonebraker Referencing Resistivity Survey Information. (28)

Ecology and Environment, Inc., August 16, 1982. Bid Specifications for Drilling, Installation, Development Sampling of Monitoring Wells at Jefferson/Hardin Co., Kentucky Sites. (29)

Environmental Protection Agency, August 27, 1982. Site Inspection Report. EPA, IV.

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Joyner, R. W., February 10, 1980. Hazardous Waste Report--Potential Hazardous Waste Site Identification and Preliminary Assessment--Lees Lane Landfill. Environmental Protection Agency.

Hitchcock, S., February 22, 1980. Tentative Disposition for Lees Lane Landfill Requests Monitoring Wells. Environmental Protection Agency.

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Harman D., February 24, 1982. Outline of Schedule for Geophysical Surveys. Ecology & Environment, Inc.

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APPENDIX A

SITE CHRONOLOGY
LEES LANE LANDFILL
LOUISVILLE, KENTUCKY

NOTE: All chronological entries prior to December 1981 were taken directly from the December 1981 "Remedial Approach Plan for Lees Lane Landfill," prepared by Ecology and Environment, Inc.

March 13, 1975	Jefferson County Department of Health was notified of the presence of an unusual gas in the area of Riverside Gardens. Flash fires were reported around water heaters. Methane gas was detected at explosive levels.
March 19, 1975	Seven families were evacuated along Putman Street. Temporary housing was provided by the County Housing Authority. Costs for relocation and purchase of homes was in excess of \$150,000.
March 20-21, 1975	Louisville and Jefferson County Department of Health had four test wells drilled in the area of Putman Street.
April 3, 1975	Temporary restraining order issued by the Franklin Circuit Court to restrain the operation of Lees Lane Landfill.
April 8, 1975	Surveillance and Analysis Division, EPA, Region IV, reported gas sample analyses from monitor and private wells near Lees Lane Landfill. Methane gas and toxic compounds were found.
April 9, 1975	Findings of Fact and Conclusions of Law filed in Franklin Court that landfill was operating without a permit.

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July 9, 1975	Report published by John E. Heer, Jr. and D. Joseph Hagerty, consultants for Ben Hardy, entitled <u>Preliminary Report, Lees Lane Landfill</u> which recommended a gas venting system. Ben Hardy was attorney for Lees Lane Landfill owners.
July 16, 1975	Report published by Surveillance and Analysis Division, EPA, Region IV, entitled <u>Monitoring Near the Lees Lane Landfill in Louisville, Kentucky</u> . Organic and industrial type gases were found in monitor wells. Vinyl chloride was not found in the groundwater.
September 2, 1975	Report by Lees Lane Advisory Committee published. It concluded that "the concept of collecting the gases that has been proposed by the Hofgesang Company consultants appears to offer a logical approach."
September 2, 1975	Report by Louisville and Jefferson County Department of Health entitled, <u>Putman Road Gas Problem</u> , was published. It concluded that a gas pressure gradient existed between the landfill and the monitor wells.
October 30, 1975	Corps of Engineers informed Kentucky Department of Natural Resources and Environmental Protection that the landfill operators had excavated to the center line of the proposed levee in the southern most section of the landfill and the excavations had been filled in with "garbage, tree limbs and other unsuitable fill."
October 1977	Planning Commission completed a Small Area Study of Riverside Gardens which recommended that Fiscal Court fund an engineering study of the gas problem.
January 1978	Task Force was formed to initiate an engineering study of the methane gas problem.

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March 1978

Fiscal Court authorized \$60,000 from Community Development funds to conduct the study.

May 12, 1978

Housing Authority entered into contract with Stearns, Conrad, and Schmidt, Consulting Engineers (SCS) to perform the study.

June 1, 1978

SCS Engineers began 16 month long project entitled Engineering Study of Hazardous Gas Migration at Lees Lane Landfill.

June 5-12, 1978

SCS Engineers installed monitor wells near Lees Lane Landfill.

August 22, 1978

SCS Engineers submitted to Jefferson County estimated costs and profits which might be realized from a gas recovery system on the landfill property.

September 27, 1978

Jefferson County Housing Authority Board of Commissioners corresponded their opinion to Judge Mitch McConnell that they felt there was "a great potential of eminent danger of an explosion from the existing methane gas."

November 13, 1978

New Task Force in Jefferson County met to discuss EPA funding sources for gas venting system.

December 12, 1978

SCS Engineers submitted the Environmental Review document for Lees Lane Landfill gas venting system.

December 14-
16, 1978

EPA National Enforcement Investigations Center (NEIC), Denver, submitted its Phase I investigation of Lees Lane Landfill vicinity for methane gas. "High concentrations of methane/combustible gas were present in a number of test wells sampled during this investigation."

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December 16, 1978 SCS Engineers reported gas sample analyses from test wells near Lees Lane Landfill.

January 8-12, 1979 NEIC, Denver, submitted its Phase II investigation of Lees Lane Landfill vicinity for methane gas. "The levels of methane and other combustible gases in these homes (Riverside Gardens) were well below the explosive level of methane."

January 9, 1979 EPA, Region IV, urged HUD to release funds to finance the installation of the methane gas venting system.

January 11, 1979 Attorney James F. Bycott, EPA, Legal Branch informed the Public Works Department of Louisville and Jefferson County that "Since EPA, Region IV, feels that methane-gas buildup does present an immediate hazard, the city and county should proceed to install the gas-venting system to alleviate the problem. Region IV will assist . . . in any way possible to facilitate the HUD-community development funds."

January 12, 1979 Marvin B. Duning, EPA Assistant Administrator for Enforcement informed Region IV Administrator that he did not concur with the initiation of an imminent hazard prosecution in the case of Lees Lane Landfill.

January 24, 1979 Attorney James F. Bycott, EPA, Legal Branch, recommended further investigations around Lees Lane Landfill.

March 16, 1979 EPA, Region IV, Chief of Residuals Management Branch reported that since methane gas adjacent to houses in Riverside Gardens was only 0.1 to 0.5% by volume, EPA Headquarters did not recognize an imminent hazard under Section 7003 of the Resource Conservation and Recovery Act.

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April 25, 1979

Attorney James F. Bycott, EPA, Legal Branch, reported that "EPA Headquarters insists that, at the bare minimum, 1% methane by volume above ground is necessary for the filing of a Section 7003 Resource Conservation and Recovery Act lawsuit. Attempts to refer a case predicated on water pollution occurring under the ground also appear stymied."

July 30, 1979

SCS Engineers submitted to Jefferson County the design report for the Lees Lane Landfill Methane Gas Control System.

February 27, 1980

Kentucky Department of Hazardous Materials and Waste Management (HMWM) visited site and found approximately 200 drums. Apparently drums were deposited years ago; earth cover had eroded.

February 29, 1980

Kentucky Department of HMWM Emergency Coordinator and Jefferson County Health Department visited site and found drums in bad condition, several rusted through, 100 feet from river bank and approximately 10 feet vertical rise from river. Two samples were taken. Samples were a phenolic resin.

March 4, 1980

Jefferson County Health Department sampled 4 drums and determined flash points to be 85°F and found relatively high concentrations of metals: Cu, Cd, Ni, Pb, and Cr.

March 14, 1980

Kentucky Division of HMWM sent Ben Hardy a letter describing hazardous situation and requested removal and proper disposal of drums.

March 20, 1980

EPA Disposal Site Unit informed EPA Environmental Emergency Branch of possible 311 Action under the Clean Water Act at Lees Lane Landfill if river rises above drums.

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March 24, 1980

Ben Hardy replies by letter that he does not feel that drums are a hazard and that J. H. Realty is the property owner, not Hofgesang Sand Company.

March 27, 1980

Additional samples were taken of drums and analyses indicated flashpoints ranging from 77°F to >150°F. One sample tested negative for PCB.

March 31, 1980

Abate and Alleviate Order prepared by State.

April 2, 1980

Kentucky Division of HMWM received results of flashpoint testing of random samples along the Ohio River bank on Lees Lane Landfill property. Results indicated flashpoints ranging from 75°F to >150°F.

April 2, 1980

Secretary of Kentucky Department of Natural Resources and Environmental Protection (DNREP) issued an Order to Abate and Alleviate conditions surrounding the disposal of barrels of hazardous wastes on property owned by the Defendants.

April 8-9, 1980

Division of HMWM analyzed barreled samples. The two most hazardous materials were compounds of benzene and phenol.

April 11, 1980

A hearing was held at which time the DNREP presented evidence substantiating the conditions at the Lees Lane Landfill.

May 21, 1980

Division of HMWM reported that Ben Hardy had filed an exception to the State's Abate and Alleviate Order indicating that he plans to take no action to remove the 400 exposed drums.

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May 21, 1980

Division of HMWM reported that Jefferson County was not able to start the construction of the gas collection system due to insufficient funds. Jefferson County asked SCS Engineers to redesign the system to use existing wells off site as a venting system.

June 12, 1980

Secretary of DNREP issued an Order stating that the Order to Abate and Alleviate shall remain in full force and effect.

July 14, 1980

The EPA Uncontrolled Site Section of the Disposal Site Unit completed a tentative disposition concluded that Lees Lane Landfill should be considered for enforcement action. The Site Referral Package prepared by the Uncontrolled Site Section, was forwarded to the Enforcement Division. Health threats noted were as follows: "The drums of hazardous material are situated in the flood plain of the Ohio River which is a public drinking water supply."

August 5, 1980

The Kentucky DNREP filed a complaint against J. H. Realty, Inc. and The Hofgesang Foundation, Inc., owners of Lees Lane Landfill, stating in part, "That the Defendants have failed to abate and alleviate the conditions surrounding the disposal of barrels of hazardous waste on its property as order by the Secretary and to the best of Plaintiff's knowledge has failed to act in any fashion to remedy those conditions" (Filed in Franklin Circuit Court).

October 1980

Jefferson County installed 11 new gas-venting wells and a collection/venting system.

January 1981

Kentucky DNREP filed applications with the Corps of Engineers and Jefferson County to install 5 to 8 groundwater monitoring wells near Lees Lane Landfill. Funding is, in part,

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from the Water Resources Council of the Department of Interior. Mr. Hardy was going to allow access to the river side of the landfill.

January 15, 1981 Mr. Ed Robinson, Jefferson County Works Department, reported that the new gas venting system was working satisfactorily.

January 19, 1981 Kentucky DNREP was granted a Summary Judgement against Ben Hardy which allowed him 90 days to clean-up drums along the river bank.

March 1981 Groundwater monitoring wells completed.

April 1981 Wells were sampled by joint effort of EPA, KY-DNREP, and Ecology and Environment, Inc. "These wells were not constructed and developed properly in order to obtain true representative groundwater samples. Consequently, the analytical results are elevated because of the large quantity of sediment in the samples" (EPA, SAD, Athens, GA., 1981).

September-
October 1981 Ben Hardy had exposed drums along river bank pumped of liquid waste. The solid wastes and empty drums were buried on-site as per a plan approved by KY-DNREP.

December 1981 "Remedial Approach Plan for Lees Lane Landfill," prepared by Ecology and Environment, Inc., and submitted to EPA Region IV.

March 8, 1982 HNU photoionizer and radiation survey conducted by Region IV FIT personnel did not detect organic vapor or radiation levels above background (E & E, FIT, Site Safety Plan, 1982).

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March- June 1982	Region IV FIT personnel conducted resistivity and magnetometer surveys
June 28, 1982	Lees Lane Landfill received a score of 39.52 on the Hazard Ranking System
July 2, 1982	Expanded eligibility information package for Lees Lane Landfill submitted by EPA Region IV to EPA Washington, D.C.
August 16, 1982	Bid specifications regarding drilling, installation and sampling of monitoring wells at Jefferson/Hardin County, Kentucky sites (includes Lees Lane Landfill) submitted by Ecology and Environment, Inc. to EPA
November 3, 1982	Sediment and leachate sampled by Ecology and Environment, Inc.
December 1982	The Lees Lane Site was ranked 260th of 418 sites on the Proposed National Priorities List issued by EPA.
December 27, 1982	Drilling subcontract awarded to Fuller, Mossbarger, Scott & May to install new monitoring wells.
February 1983	Twenty-five drums were discovered on-site by NUS FIT. These barrels were apparently missed during the October 1981 cleanup.
March 22, 1983	Lab data available from November 1982 sediment and leachate sampling.

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Target Dates (Estimated)

May 2, 1983	NUS FIT will commence drilling of monitoring wells.
June 6, 1983	Complete drilling of monitoring wells.
June 20-24, 1983	NUS FIT will collect groundwater samples.
September 1, 1983	Lab data from January 20-24, 1983 groundwater should be available.

APPENDIX B

PRELIMINARY WORK PLAN OUTLINES
LEES LANE LANDFILL RAMP
LOUISVILLE, KENTUCKY
MAY 1983

[This appendix contains general work plan outlines for five IRM's and for the
[remedial investigation/feasibility study. The outlines presented here are
[preliminary and general in nature. More detailed work plans will be required
[before proceeding with the actual work. In preparing the work plan outlines for
[inclusion in this RAMP, every attempt was made to identify all tasks necessary to
[complete the work. It is entirely possible however, that modifications to these
[tasks and/or additional tasks may be identified during the development of more
[detailed work plans.

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LEES LANE LANDFILL

MAY 1983

PRELIMINARY WORK PLANS FOR INITIAL REMEDIAL MEASURES

A. Implement a long-term preventive maintenance program for the existing gas venting system.

1. Remedial investigation - none required.

2. Feasibility study - none required.

3. Design

a. Task 1 - Conduct inspection and maintenance check of existing gas venting system. Identify immediate corrective maintenance measures which may be necessary as well as preventive maintenance items.

b. Task 2 - Consult equipment manufacturers and other reference sources to identify all possible preventive maintenance items.

c. Task 3 - Design preventive maintenance program which defines maintenance procedures and frequency.

4. Implementation

a. Task 1 - Determine who will implement and perform PM program.

b. Task 2 - Establish government reporting and review mechanism (if necessary) to insure that the PM program is properly adhered to.

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- B. Initiate a long-term air monitoring program at the exhaust of the gas venting blower and in/around selected residences near the site.

1. Remedial investigation - none required.

2. Feasibility study - none required.

3. Design

- a. Task 1 - Define sampling program. Major elements of program would include type of sampling equipment, sampling locations, analyses, and sampling frequency.

4. Implementation

- a. Task 1 - Determine who will administer the program and how the monitoring work will be performed.
- b. Task 2 - Establish government reporting and review mechanism (if necessary) to ensure that
- (1) the monitoring program is adhered to
 - (2) proper action is taken if an air quality problem is identified.

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C. Survey of off-site well usage

1. Remedial investigation - none required

2. Feasibility study - none required

3. Design

a. Task 1 - Investigate community relations aspects associated with the well usage survey, and identify any community relations requirements.

b. Task 2 - Identify the following:

- (1) information needs**
- (2) extent of area to be surveyed**
- (3) survey techniques**

4. Implementation

a. Task 1 - Perform any necessary community relations efforts prior to conducting survey.

b. Task 2 - Obtain as much data as possible by working through government agencies, water utility, etc.

c. Task 3 - If necessary, obtain balance of data by conducting survey of private residences, commercial entities, and industries.

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D. Installation of warning signs around site perimeter

1. Remedial investigation - none required

2. Feasibility study - none required

3. Design

- a. Task 1 - Prepare a sign fabrication specification. Key elements of the specification would include size, height, materials of construction, wording, colors, etc.
- b. Task 2 - Identify spacing interval between signs. This may include research into applicable federal, state, county, and municipal regulations and/or guidelines.

4. Implementation

- a. Task 1 - Fabricate signs.
- b. Task 2 - Install signs.

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E. Removal of drummed waste from the northern tract of the landfill

1. Remedial investigation - none required

2. Feasibility study - none required

3. Design - none required

4. Implementation

- a. Task 1 - Procure contractor for the removal of the drums and wastes.
- b. Task 2 - Conduct a sampling and analysis program, and perform a waste/drum removal operation.
- c. Task 3 - Provide technical supervision for all phases of work.

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LEES LANE LANDFILL

MAY 1983

PRELIMINARY WORK PLAN FOR REMEDIAL INVESTIGATION
AND FEASIBILITY STUDY

A. Remedial Investigation

NOTE: Every effort should be made to ensure that complete and valid data are obtained in all future investigative sampling efforts.

1. Air - No structured air sampling program per se is recommended for the remedial investigation. It is assumed however that the long-term air monitoring program which has been recommended as an IRM, will be implemented early enough so that the first set of monitoring data will be available before the feasibility study begins.

Appropriate air monitoring techniques should be employed during any on-site drilling operations. Air monitoring should include combustible gases, oxygen, and organic vapors.

2. Groundwater

- a. Task 1 - Evaluation of existing monitoring wells.

- (1) Contact governmental agencies, contractors, drillers, previous reports, etc., for logs and construction information.
 - (2) Conduct field inspection of existing wells to evaluate water level measurement, purging, water level recovery measurement, materials of construction and integrity, depth measurement, and other items as necessary.
 - (3) Make an evaluation as to the value of each monitoring well with respect to generating valid monitoring data.

NOTE: Task 1 includes evaluation of the monitoring wells which will be drilled at the site between February and April, 1983.

b. Task 2 - Installation of new monitoring wells (3-5 holes).

- (1) Method -Hollow-stem auger, casing and rotary, or other method deemed acceptable. Split spoon samples will be taken every 2 1/2 feet. Two or more drilling rigs may operate simultaneously. Nests: One hole drilled to bedrock for deep well. A second hole will be drilled to intermediate depth for intermediate and shallow well. Split spoon samples will not be taken from shallow hole.
- (2) Emplacement - Wells will be constructed of 2-in PVC, 5 ft slotted screen. (There should not be a problem with adsorption of organics by the PVC, if wells are purged immediately before sampling.)

Gravel/sand pack around screen. Bentonite seal above gravel pack, at least 2 ft thick. In holes containing two wells, a bentonite seal will be emplaced below gravel pack also. The annulus will be filled with a cement-bentonite slurry. Notched PVC caps and protective locking steel caps will be installed.

- (3) Development - Purge each well and measure recovery.

c. Task 3 - River gaging

- (1) Contact government agencies, Army Corps of Engineers, U. S. Geologic Survey, etc., about existing gaging stations(s).
- (2) Construct simple gaging station near site if necessary.

d. Task 4 - Groundwater sampling

NOTE: It is proposed that samples be collected four times in six months. Each sampling would consist of approximately 20 to 30 samples. The scope of the groundwater sampling program may be reduced significantly if the results from the first and second round of samples warrant a reduction in scope.

- (1) Monitoring wells - Measure water levels before purging. Purge stagnant water from monitoring well and collect sample. Filter the raw sample before analysis or addition of preservatives.

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Analyze for pH, specific conductance, TDS, TOC, Cl^- , TOH, Sn, As, Be, B, Cd, Co, Cr, Cu, Pb, Hg, Ni, Se, Sr, Ag, Ti, Zn, V, Al, Mn, as well as a GC/MS screen for compounds listed in the NPDES Permit Application, Part VC, including PCB and pesticides.

(2) Off-site Service Wells -Select a network of residential, commercial, and industrial wells within one-half mile of the site.

Talk to the owner, driller, etc. to learn as much as possible about well construction. Analyze groundwater samples using GC scan.

Perform a GC/MS screen if scan is positive.

- e. Task 5 - Elevation Survey. All wells must be surveyed to determine surface elevation.
- f. Task 6 - Evaluate Data. Obtain, summarize, and evaluate all groundwater data. Based on the data, determine if the proposed long-term remedial responses contained in this RAMP are adequate. If appropriate, identify modifications and/or additions to the remedial responses which should be included in the feasibility.

3. Soil

- a. Task 1 - Establish ground control and grid layout.
- b. Task 2 - Develop aerial photograph and map.
- c. Task 3 - Obtain surface soil samples.
- d. Task 4 - Obtain subsurface soil samples. (Concurrent with drilling of new wells - refer to Groundwater, Task 2, above).
- e. Task 5 - Reevaluate 1982 geophysical data.
- f. Task 6 - (If necessary) - Conduct high resolution geophysical survey.
- g. Task 7 - Evaluate Data - Obtain, summarize, and evaluate all soil and waste location data. Based on the data, determine if the proposed long-term remedial responses contained in this RAMP are adequate. If appropriate, identify modifications and/or additions to the remedial responses which should be included in the feasibility study.

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4. Surface Water

NOTE: It is proposed that each sampling location be sampled three times within a six-month period. The scope of the surface water sampling program may be reduced significantly if the results from the first round of samples warrant a reduction in scope.

Laboratory testing of surface water and sediment samples may include, but will not necessarily be limited to:

- GC scan for organics listed in Part VC of the NPDES Permit Application.
- GC/MS analysis as needed.
- Primary drinking water standards not analyzed above.
- Additional metals as needed.

Each surface water sample will be accompanied by a corresponding sediment sample.

- a. Task 1 - Ohio River Sampling. Upstream and downstream locations, and intermediate locations as deemed necessary.
- b. Task 2 - Mill Creek Sampling. Upstream and downstream locations, and intermediate locations as deemed necessary.
- c. Task 3 - Pond Sampling. Collect 1 to 4 samples from each of the two ponds on-site.
- d. Task 4 - Swamp and Intermittent Streams. These should be sampled if they are in existence during any of the three sampling trips.
- e. Task 5 - Seeps. Sample any open seeps found during any of the three sampling trips.
- f. Task 6 - Evaluate Data. Obtain, summarize, and evaluate all surface water sampling data (including the results of the November 1982 leachate sampling). Based on this data, determine if the proposed long-term remedial responses contained in this RAMP are adequate. If

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appropriate, identify modifications and/or additions to the remedial responses which should be included in the feasibility study.

5. Ohio River Benthic Ecosystem Study

Conduct a brief sampling and analysis program to determine if Ohio River benthic macroinvertebrates or benthic vegetation in the vicinity of the Lees Lane Site are being adversely affected.

6. Remedial Investigation Report

- a. Task 1 - Prepare a comprehensive report which summarizes all the results of the remedial investigation. The report will identify modifications and/or additions to the long-term remedial responses, (if any), so that the scope, budget and scheduling for the feasibility study can be adjusted if necessary.

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B. Feasibility Study

The feasibility study as it is currently proposed looks at only two long-term remedial responses:

- Erosion control measures along the Ohio River bank.
- "No Action Alternative"

As discussed previously, the "No Action Alternative" does not include any long-term remedial responses per se, but it does assume that IRM's and long-term maintenance and monitoring activities contained in this RAMP will be implemented.

The scope of this feasibility study work plan, therefore, assumes that erosion control along the Ohio River bank is the only type of long-term remedial response that will be evaluated. It is important to emphasize that additional long-term remedial responses may be identified at the completion of the remedial investigation. If additional long-term remedial responses are identified, then the scope, cost and schedule of the feasibility study will need to be expanded accordingly.

1. Task 1 - Data review. Compile all relevant data and summarize.
2. Task 2 - Establish Objectives. Define the problem, and identify objectives and criteria.
3. Task 3 - Identify Alternatives. Determine which specific alternatives should be investigated.
4. Task 4 - Treatability Studies. Conduct any lab testing necessary to evaluate engineering properties of the soil and to select detailed design criteria.
5. Task 5 - Evaluate Alternatives. Perform a technical feasibility and cost effective analysis of the alternatives identified in Task 3.

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6. Task 6 - Alternatives Report. Prepare a brief report which summarizes the evaluation of alternatives. This report will provide adequate information to the appropriate parties who will then select the optimum alternative(s).
7. Task 7 - Conceptual Design. Prepare a conceptual design and a preliminary construction cost estimate for the selected alternative(s).
8. Task 8 - Community Relations Support. Provide community relations assistance as necessary.
9. Task 9 - Final Report. Prepare a final report which summarizes the conceptual design, preliminary construction cost estimate, and implementation factors pertaining to the chosen alternatives(s).

APPENDIX C

LEES LANE LANDFILL
PLANNING COST ESTIMATES FOR REMEDIAL ACTIONS
(JANUARY 1983 DOLLARS)

NOTE: Appendix C presents a further breakdown of the costs contained in Table 12-1. In most cases, cost curves, unit costs, and other rough estimating techniques were used. These costs should be used for general planning purposes only.

	Cost Range	
	Low	High
A. Initial Remedial Measures		
1. Gas venting system PM program ⁽¹⁾		
a. Design and implementation	\$ 6,000	\$ 15,000
Total	\$ 6,000	\$ 15,000
2. Installation of warning signs		
a. Remedial investigation	\$ 0	\$ 0
b. Feasibility Study	0	0
c. Design	6,000	8,000
d. Implementation	<u>7,000</u>	<u>12,000</u>
Total	\$ 13,000	\$ 20,000
3. Survey of off-site well usage		
a. Remedial investigation	\$ 0	\$ 0
b. Feasibility Study	0	0
c. Design and implementation	<u>5,000</u>	<u>10,000</u>
Total	\$ 5,000	\$ 10,000
4. Long-term air monitoring program ⁽²⁾		
a. Remedial investigation	\$ 0	\$ 0
b. Feasibility Study	0	0
c. Design and implementation	<u>6,000</u>	<u>15,000</u>
Total	\$ 6,000	\$ 15,000
5. Removal of drums found in January 1983		
a. Contract Procurement	\$ 2,000	\$ 3,000
b. Waste sampling and removal	8,000	13,000
c. Technical Supervision	<u>6,000</u>	<u>10,000</u>
Total	\$ 16,000	\$ 26,000
Total IRMs	\$ 46,000	\$ 86,000
Total IRMs excluding CLP Costs	\$ 46,000	\$ 86,000

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		Cost Range	
		Low	High
B. Remedial Investigation (RI)			
1.	Work Plan	\$ 20,000	\$ 30,000
2.	Initial RI Activities	20,000	30,000
3.	Other RI Activities		
a.	Groundwater		
(1)	Task 1 Evaluate existing wells	9,000	11,000
(2)	Task 2 Install new wells	69,000	81,000
(3)	Task 3 River gaging	5,000	7,000
(4)	Task 4 Groundwater sampling	34,000	39,000
(5)	Task 5 Elevation survey	8,000	12,000
(6)	Task 6 Evaluate data	5,000	10,000
(7)	Laboratory analysis		
	CLP	60,000	100,000
	Non-CLP	0	0
b.	Soil		
(1)	Task 1 Ground control	5,000	8,000
(2)	Task 2 Aerial photo and map	6,000	12,000
(3)	Task 3 Surface samples	9,000	14,000
(4)	Task 4 Subsurface samples	3,000	5,000
(5)	Task 5 Reevaluate geophysical data	8,000	16,000
(6)	Task 6 Geophysical survey		
	(if necessary)	5,000	8,000
(7)	Task 7 Evaluate data	4,000	7,000
(8)	Laboratory analysis		
	CLP	20,000	30,000
	Non-CLP	0	0
c.	Surface water		
(1)	Task 1 Ohio River	5,000	8,000
(2)	Task 2 Mill Creek	4,000	6,000
(3)	Task 3 Ponds	3,000	4,000
(4)	Task 4 Swamp and intermittent streams	3,000	4,000
(5)	Task 5 Seeps	3,000	4,000
(6)	Task 6 Evaluate data	2,000	4,000
(7)	Laboratory analysis		
	CLP	40,000	60,000
	Non-CLP	0	0

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		Cost Range	
		Low	High
d.	Ohio River Ecosystem		
(1)	Design and conduct sampling program	\$ 25,000	\$ 35,000
(2)	Laboratory analysis		
	CLP	0	0
	Non-CLP	20,000	30,000
e.	Remedial investigation report	10,000	20,000
Total RI		\$405,000	\$595,000
Total RI excluding CLP Costs		\$285,000	\$405,000
C. Feasibility Study (FS)			
1.	Work Plan	\$ 10,000	\$ 15,000
2.	Task 1 Data review	7,000	9,000
3.	Task 2 Establish objectives	6,000	8,000
4.	Task 3 Identify alternatives	6,000	8,000
5.	Task 4 Treatability studies	6,000	8,000
6.	Task 5 Evaluate alternatives	12,000	14,000
7.	Task 6 Alternatives report	12,000	14,000
8.	Task 7 Conceptual design	12,000	14,000
9.	Task 8 Community relations	4,000	5,000
10.	Task 9 Final report	15,000	20,000
11.	Laboratory Analysis		
	CLP	0	0
	Non-CLP	5,000	10,000
Total FS		\$ 95,000	\$125,000
Total FS excluding CLP Costs		\$ 95,000	\$125,000

- (1) Includes design of a PM program and the cost of setting it up. Does not include the annual cost of the PM program.
- (2) Includes design of the air monitoring program and the cost of setting it up. Does not include the annual monitoring cost.

Note: All of the costs in this table assume a minimal amount of personal health and safety protection (level C & D) during all on-site activities. If it is found that more extensive protection measures are required (butyl rubber suits, SCBAs, etc.), then costs will increase significantly.